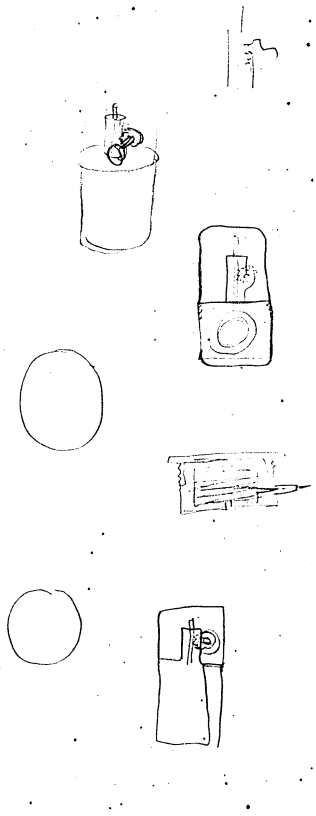
Experimental Researches, Vol. 4, Cat. 996

This notebook covers the periods August 1876-January 1877 and June-October 1878. The notes and drawings, some of which are signed and dated by Edison, deal with the electromotograph, etheric force, electric drive for sewing machines, and octruplex (acoustic) telegraphy. There are also extensive tests of chemical solutions, some carried out by Edward H. Johnson, and a patent specification on the chalk-drum telephone, dated 1879.

The book also contains a series of notes and drawings copied into it by William Carman. The originals of this material can be found in the following locations: pages 75-97 in Unbound Notebook, Vol. 18; pages 175-192 in NS-78-012, Unbound Notes and Drawings; and pages 270-283 in NS-78-003, Unbound Notes and Drawings. The book contains 640 numbered pages.

Blank pages not filmed: 106-173, 194-269, 284-639.



Electro Motograph.

Aug 24/96.

Experiments today – To obtain a solution which will show greatest difference in friction with the minimum of Polarization

Note We have found (Aug 23) that passage of Current through any Substance Containing Strong Solution of Caustic Soda – that great Polarization is had. If the Accump. Spaniel one Constantly used this Polarization is not noticeable & no inverted Current is discharged from the Electrodes. But if the Current is allowed to remain closed – the point resting upon one spot – Excessive Polarization takes place – so great that a Current from 25 Carbon Bath is insufficient after 2 or 3 mins to work promptly an Ordinary Relay – but if the Point be moved to a new surface on the shaft the Current passes with full strength, & the Relay work strong. If the point remains on same spot & the Current is reversed – the same effect is had – but again rapidly weakens. We have also found that this Polarization is not so great in some solutions as in others for instance if we use 4 strips cut of different solution respectively Fused Cyanide Potassium, Pyro Gallic Acid – Caustic Soda – & Acetate Mercury & Caustic Potash – they Polarize very rapidly. Except the last which requires a long passage of the current – to show any Polarization. This explains why the best results have heretofore been obtained by the Mercury Salt. And also why a Shunt could not be used with solution which Polarize rapidly

– The Electrodes sending an Inverted Current thus disturbing their own adjustment, by Circulating in the Shunt.

The above we consider a very important "Peg" discovery – Although noticed many times previously – we were not forcibly impressed by it because of the feebleness of the showing – the Caustic Soda however showed the Peg so well defined as to compel his recognition – whereupon a great many therefore unexplained Phenomena – become Easy of Explanation

It is noticeable that Caustic Soda is an Element of Maximum Effect, whatever direction used it appears to produce results more marked than other solutions.

With this New Element in mind – we now proceed to Test for a Non-Polarizing Agent Either to use Independently or to Combine with Caustic Soda. –

Elk. Coo Ohms. 25 Ally Pt Carbon
Hand Motograph – W.U. Relay 140 ohm in Ckt.
Hand Points – Round 1/16 Dia Drain (Oval End)
Platt. Pt. + Tgt – Surface
In Each case we use. Over 20 d/7 ammeter Gal. as next below in Coil. No 10. on Load –

No 1

Ord. Auto Paper – Treated G. Pattern.
When quite wet scarcely any Polarization – scarcely any working difference
Quite Dry. Resist Rel. Great Polarization + Gd. Mag. Dif.

No 2.

Mono-chloro. Acetic acid Res low. Poly. low
Working Dif O – Phenomena Paper ~~Comes~~ adhere to Flat Platin – on Ogden –

No 3.

Grape Sugar – Res. Variable on Dif metals #
Re on Tin. Lead. Platinum Greatest
The Difference of Res. betw. Tin + Platinum Enormous.
Polarization very rapid. Probably varies on the Surface but this may be caused by change of Resistance
Re working Dif. It increases friction on Dif.

No 4

Acetate of Strychnine – Res. high – Poly. Rel. No Diff.
Res. Friction on Dif. Marks on Dif. + Silver –

No 5.

Mica Ammoniacal – Res. Low. Poly. Med. Least on Pat. Greatest on Aluminium + Nickel – Dif. medium –
Reaches 10,000)

No 6.

Perchloride Potash – Res. low. Poly. gk. Dif Medium

No 7.

Lacto Phosphate Bismuth – Res high Poly gk. Dif 0

No 8.

Phosphate Manganese – R. Low. P. gk. D. 10,000 Wk. sharp.

No 9.

Sulphate Minimum – R. Low. P. Mid. D. 10,000. Nix.

No 10.

Phosphate Zinc. R. Mid high P. gk. D. Nil.

No 11.

Hypo. Sulphate Barium R. Lets. P. Slow. Very slow on Platt
Dif Nil. Inc. Fric on Dif.

No 12.

Iodide Lime. R. Very low. P. Very Slow. Dif nil. Blk Mk only. Iodine Mk on Or

No 13.

Lactate Quinine R. Very High P. Mod. D. Nil.

No 14.

Sulphate Strychnine = R. High P. Very gk. Dif Nil.

No 15.

Chloride Propalamine - R. Low. P. gk. Dif 10,000 Nil -

No 16.

Saponin - R. Very High P. Good Strong Dif - 10,000 feel it.

No 17.

Nitrate Strychnine R. High. P. gk. D. 10,000 Nil.

No 18.

Linear Caustic R. Low. P. Very gk. D. Nil. Blk Mk on Ky. Inferior

No 19.

Chloric Acid R. Low. P. gk. D. 10,000 feel it. Red Mk on Ox. Plat. 10,000 - Sensitive - Sty.

20

Sulph. Cinchonidin. R. High. P. Very gk. D. Nil.

21.

Chloride Aluminum R. Low. P. Very gk. D. 10,000 feel it -

22

Iodic Acid. R. Low. P. gk. D. 10,000 Nil. - Faint Blk only. Glass

23

Sir Nitrate Iron. R. Low. P. Good. D. Nil.

24.

Iodide Ammonia R. Very Low. P. gk. Dif Nil. Inc. fric. on Ky. Strong Inc. Very noticeable on 10,000 - Fric. Iodine Mk on Ox.

25.

Valerianate Potash. R. Low. P. gk. Dif. 10,000 - feel it - D. Inc. fric. on Ky. Inc. Faint Blk Mk On Ox.

26

Nitrate Uranium R. Low. P. Very gk. - gk. Mk on Ky. Dif 10,000 Slight Yellow Mk on Ky.

27

Uric Acid. R. Low. P. gk. Dif 0 -

28

Pepsin. R. Very Low. P. Very Slow. D. 10,000 ok. Ot. Short.

29

Ferrid Cy. Potash. R. Very Low. P. Very Slow D. Nil: This is a saturated Sol.

Blue Mk on Ox. Mk Very Strong thro. 10,000 -

#

Phosphate Potash - R. Low. P. Slow. Ex. on Plat. Apparently to Poly on Plat. Dif 10,000 - 9,000. With Pressure it very Strong through. 10,000 Thru.

31

Tungstate Soda. R. Low. P. Very gk on all but Tin & Plat. apparently nonexistent

Dif. Strong on 10,000 Best on Metals Tolerably gk. Not feel on Plat. & Tin.

32 = Chloride Nickel. R. Low. P. Quick. Dif Nil.

33 = Bin. Oxalate Potash - R. Low. = P. Mod. gk. Dif. 10,000

34 = Sulphate Cadmium = R. Low. P. Very Slow. - Probable Insoluble } Dif Nil. Blk Mk on Ky. Inferior

34 = Formate Soda = R. Low } P. Very Slow on Plat. - Dif. on Metal. } D. Strong Weak on Plat. Good on Nickel Thinc Red. of Paper on Aluminum Very gk. -

35 = Lactate Zinc. R. Low. } P. gk. } Dif Nil on 10,000 =

36 = Tri. Chromate Ammonia - R. Low } P. Very Slow Exp. on Plat. Dif on 10,000 Nil.

37 = Citrate Potash = R. Low } P. Varies on all Metals - Zinc Quick. Plat. None = D. Strong on 600 10,000 Nil.

38 = Nitrate Magnesia R. Low / P. Pretty Quick. / Dif Nil =

#

39 = Tartrate Potash - R. Low / P. Quick on all Metals - Very Slow Plat. not Nickel and Zinc / D. Strong on Plat. Thru 30,000 Inc. Fric. on Ox.

40. Oxalate Soda - R. Low / P. Quick. Except on Plat. Plat. gk / D. 10,000 =

41 Acetate Baryta R. Low / P. gk. / D. 10,000

42 = Bi-Sulphate Potash - R. Low / P. Variable on Dif Metals / D. Nil

Phenomenon - Low. of Paper on Aluminum on Ky.

Great. On Ox. Low. Contact - Ex. Confirm

a Statement Noticed in a Scientific Paper. That the Res. of Aluminum Electrodes varied according to Direction of Current

43. Phosphate Soda - R. Low. / P. Variable / P. none on Pt. Plat / D. Strong on 20.000.

44 Citrate Ammonia - R. Low / P. Variable / P. Good on Plat. / D. Very marked on 20.000 others -

45 Sulphate Magnesia R. Low / P. Good. /
Sec. Fric on Hy. Common on two others By Inc. Res of Pt to 40.000 other action is Reversed. - & it becomes Very Strong the Hy. & Maintains its direction.
On Hy. it adheres to Plat (Pt Pt)

46. Borate of Soda = R. Low / P. Good - almost Insolubles items
On two. Sec. Fric on Hy. On 10.000 Reverses action

47. Syro Gallic Acid / R. Low / P. gk. / D. Nil Blk Ppt on Hy.
Yellow Ppt on Ox. - Most sensitive - Pot if thro. 10 000

48. Bi Chromate Potash. R. Low. P. Variable, Best on Plat Strong & Scarcely any -
D. Mod. on 10.000 - Pot if on 40.000 =

49. Bi Bichromate Potash R. Low. P. Variable Best on Mod all / D. Strong on 10.000 Pot if on 40.000

50. Gum Arabic. R. Low. P. Good. on most of Metals. } D. Strong On 40.000

51 Gallic Acid. R. High P. gk. D. Good on 10. Pot if on 40.000

52 Licorice R. Low. P. Mod. D. on 600 Enormous. Mod on 10,000 =

53. Formate of Copper R. Low. P. Mod. D. 40. nil -

54. Acetate Mercury & Caustic Potash.
Rec. Very Low - P. on Hy. Variable on all
Polarizes quite rapid on all Except Platinum
Apparently none on Platinum & Platinum
On Oxygen - P. Good. on all. Sec. Platinum
2d Test - Shows slight Pol. on Hy. on Platinum
Diff. Very Strong on 50.000

55. Bi Carbonate Soda Rec. Low. P. Variable on Ox & Hy
None on Ox. when reacts on Nickel -
Diff. Strong on 50.000. —

56. Bromid of Potassium. R. Low. P. Scarcely any on Hy -
Except on Silver. None on Ox. on any Metals
D. 10.000 =

57. Nitrate Potash. R. Low. P. none on Hy. or Ox.
Dif. Slight On 20000. -

58. Bermuda Arrowroot R. Low. P. Variable, Best on Mosh On Hy. On Ox. Variable none
On Plat - Dif good on 20.000.

59. Bromide of Cadmium R. Low. P. Feebly.
R. Very High on Aluminium. P. Best. on Ox.
Gives a Black Ppt on Hy. Dif. None

60 Chlorate of Potassium R. Low - P. None -
D. Very Strong on Hy & Fair On Ox. on 600.
On 20.000. Fair on 40.000 Pot if =

61 Hydrate Potassa (Caustic Potash)
R. Low. P. Best on all but Plat. Apparently
No Pol. on Hy. Pol. Slowly on Nickel
Best On Ox. Pol. Distinctly on all
but Plat On Ox. Diff on 20.000
Strong Diff. On 40.000.

62 Sulphate Zinc. R. Low. P. Ox Feebly on all -
Ox On all - Dif Nil -

63 Common Alum. R. Low. P. Ox Slow on Plat
Best on others. Ox Slow on Plat Best on others
Diff. None on 20.000

65. Chromic Acid. R. Low. P.Nt Just on all — Ox — Slowly on Brass - More on Iron Just on other. Diff. Nil on 20000.

66. Tartrate Soda - R. Low P.Nt Just on Plat. Just on others & very decided. Almost insoluble. Ox. Acces. Just. Diff. Strong on 600 Just on 20000 others.

67. Tartric Acid - R. Enormous. Thought freely diffused P. Nt Just Ox Just. R. Varies according to the Metal Independent of Poly. Diff Just plain on 20000

68. Ferro-Cyanide Potassa. R. Very Low. Poly. Nt Variable Least on Plat. On Ox. Just on all - Diff None -

69. Hypo Sulphate Soda - R Low - Varies with Ever Metal Independent of P. Least on Plat. P.Nt Just on all but Plat none at it - Ox R. Much Low. on all - P. Slowly on all Diff. 20000 Just it -

70. Carbonate Magnesia - R. Mod High Varies with Ev Metal. Plat lowest - Potter absolute Insoluble P.Ox Same Result - Diff Very strong on 20000 Just strong on 40.000 Best on Silver & Copper Fair on Plat. Others Nothing

71. Nitrate of Ammonia R. Low. P.Nt Just on all - Ox. Ditto - Diff Nil. —

72. Licorice - R. Low. P.Nt Just on all but Pt None on it - Ox - Just on all - Diff Strong On 20000 (very) Just it on 40.000 Diff - 600 other Just on Ox -

73. Citric Acid - R. Slow & Variable Mod. Low On Plat. Very high on Aluminum Tin & Nickel —

P.Nt Just on all but Plat. Ox On all - Diff Cant feel it on 20000 -

74. Arsenate of Quinine R. Low - P.Nt Just on all - Ox on all - Diff Just on 20000

75. Nitrate of Uranium R. Low. P.Nt Slowly on all Ox. None = Diff Just it 20.000

76. Valerianate of Ammonia R. Mod. P.Nt Just very on all - Ox Same Diff fair on Plat 20000 & Diff as strong on 40000 on Copper Less on Ox.

77. Valerianate Mag. R. Variable according to Metal Least on Plat. P.Nt Just on all - Ox on all Rec Fritchin Diff Cant Just it on 20000

78. Citrate of Quinine R. Very High - P.Nt Enormous Just on all - Ox Ditto but less decided - Diff Nil.

79. Valerianate of Soda - R. Variable High Least on Plat. P.Nt Just. on all - Ox Ditto. Diff. Enormous on 600. Strong on 20.000 Just as strong on 40.000 Phenomenon Diff On Ox. - On 600 other

80. Sulphate of Soda - R. Low. P.Nt Quick - Ox Just. Plat. Silver & Copper - Slower on Nickel Aluminum & Zinc - Slowest of Iron Lower on last 3. Diff On 600 Big On 20000 Strong. Best on Last Summer Metals - on 40.000 Not much Whatever On 600 other Slight Diff on all —

81. Hippuric Acid - R. Low. Variable - P.Nt Just. Ox Ditto Diff - 600 Good -

20000 Gk Strong Beat on nickel Weak
On Plat. 40000 Gk in Plain

81 Bromide of Sodium Rec. Very Low - Pkt off
None except on Silver. Ox Gk
None except on Silver. Dif on 600 Strong
20000 Dark Gk in -

82 Arsenate Soda - Res. Mod High. Variable
Pkt Very Dark. Mass on Plat. Ox
Dark - Mass on Plat. Dif on 600
Enormous on Plat. Slips on Ox. Very Strong
On 20000 Gk Strong on 40.000 -

83. Caffein - Res. Mod. Pkt Dark.
Too Dry to work -
Gk for Wright -
August. 25th 1876

84 Acetate of Mercury & Cauric Potash Trial 2
Rec. Low Pkt P. Variable - Tin Slow - Copper Slow -
Silver Quick - Ox P. Dark on all. Inc Fric
Slightly On Ox. D. Strong on 20000 Ditto
On 40.000
Same Strip quite Dry Pkt Polarizing on all
Platin - Very slow. Aluminium Quick
Ox. Dark on all. D. 20.000 Very Strong
On 40000 Ex. Strong -
H

85. = Arsenate of Soda - R. Low. P. Pkt Rather Slow
Especially on silver - None on Platinum
Ox Gk on all - Dif 600 Big - 20.000 Strong
40000 Pretty good

86. Iodide of Quinine R. Low Mod. Pkt Very Strong
Gk on all Dark on Plat Silver & Copper Ox Ditto
600 slips slightly on Ox - Dif. Pkt Comb.
Very Strong Nothing on 20.000 Ohm

86 Margarate Soda - R Low Pkt Just on all
Except Plat off none -
Platinum - Ox Very slowly on all - Strong Comb. to
Big. Just. Except on Plat.
Dif Nothing on 20.000 -

87. Sulphate Cobalt A Very High, Pkt Gk on all
Just on Plat. Ox Slowly on all -
Dif. Nil.

88. Acetate of Silver R. Low Pkt Gk. on all but
Plat slow - Ox Gk on all but Silver
Apparently none - Dif 20.000 Not in

89. Cyanide of Mercury - R High -
Pkt Gk on all - Ox slow mainly -
Dif 20.000 Nil.

90. Acetate Aluminia Rec. Low. Pkt Gk Quick on all
& same & Aluminium much stronger Comm
Very Strong at moment of Closing - Dif 20.000 Nil
Gk. Sulphate Quinine Rec. Very High - Pkt Enormous
Ox Ditto Dif. 20.000 Nil.

92. Carbonate Lithium Rec. Low. Pkt Gk on all
but Plat - Very Slow - Ox Gk on all -
Dif 600 Slips on Ox slightly on Pkt 600
Enormous - 20.000 Very Strong 40.000 Very
Ox Strong -

93. Caffein - Rec Mod Low. Pkt Just on all
Ex. on Silver - Ox Ditto on all - Dif Nil -

94. Carbazotic Acid. Rec Mod. Low.
Pkt Just on all. Ox. on all after Still -
Dif Nil on 20.000

95. Amygdaline Rec. High Variable Pkt Just on all
Ox None Slowly on all Except Silver Just
Dif 600 20000 Nil -

96. Acetate Morphine Rec Low Variable Pkt
Just on all - Ox Ditto Dif - Nil

97. Tartrate Manganese. R High P. Ply, Dust, O. all
Ox. Dilte D. f. Nil –

98 Citrate Coffein R High Variable Pl^y Dust on
all except Platin. Very slow – Ox. Slower
On all Platin. about 3 mins – Dif Nil

99 Chloride Copper – R Low Pl^y Dust. Ox^t
Ox Dilte D. Nil.

100 Tannate Iron R. Mod. Pl^t gl^t on all – Ox^t Slower.
Dif Nothing on 20.000 Ohms.

101 Hypo Phosphate Manganese Rec. Low.
Pl^t Slowly on all Ox dif Dif Nil.
Gives Black ppt Pl^t Oxidizes dight Brown on Ohms

102. Oxin – R. Very High Pl^t Fast on Plat. Gl^t on Copper
Silver Ox Starch any Except on Silver
& Copper – Dif Nil –
Gives Yellow ppt on A. Mostly Out on O – Dif
103 Valerianate of Quinine R. Very High Mixing
Rec. Even. Pl^t Dust. Ox Much Slower
Except on Silver & Copper. Dif Nil

104 Camphoric acid. Sl High Mr High on all but
Tin Plat. Zinc. Pl^t gl^t. Ox Very Slow. Ec
On Platin gl^t. Dif 2 mins Fast if on Silver
On 600 – quite much Silver Black –
4000 Fast if on Silver –

105. Sulphate Indigo Sl Low. Mr Even Pl^t Dust. Ox Slow.
Dif – 20 mins Fast if –

106. Hydro Bromat Ammonia Sl Very Low Mr Even – Pl^t Dust.
Ox Slow. On 600 Strong 20000 Nil
Gives Bromine ppt on Ox. Golden yellow.

107 – Manganate Potash. Sl Low Mr Very Low Pl^t Dust
On all Ex Platin None on Ox – R. Dust,
Aluminium & Nickel Slower on Tin 2 Mins on Platin Dif Nil

108 – Stannate Soda Sl Low. Mr Variable High on all but Platin –
Very Variable Dif. Not Being Lower – Ox Same result.
Pl^t Fast on all except Platin – Very Slow. Ox Faster Gl^t on
All. Dif On 600. Tremendous When Point of Plat
Platin is used. Very Strong on 40000

109 Creosote Sl Very High Mr Even. Pl^t Dust. On all Except
Platin – Slow – Ox. Very Slow; Dif. 20.000 Nil

110 Oxalate Carbonate Soda. Sl Low. Mr Variable. Aluminium
High ~~Nickel~~ Nickel Low Tin & Platin Low. Copper
High. Pl^t ~~Fast~~ on all Varying Deg. Slower. Very
Slow on Plat.
Phenomenon. Plat Poly in 1 Min. then often a
Momentary Opening Recovers – Pl^t Slow
Same Phenomenon on Plat. No Dif
Ox Dif on Ox Enormous Dif on Ag.
Very Strong On 20000 Quite Strong on 40.000.
Points of Plat Platin Makes great Delicacy –

111 Acetate Iron. Sl Mod. High. Mr Covered on Zinc Pl^t Dust.
Ox Dilte. D. Inc fig. on A. D. Nil On 20 000

112 Oxalate Ammonia Sl Medium Mr Variable High Fast on Aluminium
Pl^t & gl^t Ox gl.
Yellow Paper White ppt on Ag all Except Silver
Black – Dif Nil.

113 Sulphate Aluminia Sl Most High Mr Nearly Even.
Pl^t Dust Ox Generally – Platin Enormous Dif 20.000 Ox^t

114. Permanganate Potash. Sl Low. Mr Variable Slow on Platin – Pl^t Dust on
All Except (Slight Slow) Ox. gl^t on all. Ox Dif.
Dif Strong only on Aluminium Ox 40.000 feel if only
Ox^t Aluminium – Quite Strong.

115. Tungstate Ammonia. Sl Very High Mr Even Pl^t Dust. on
All Except Platin Slow Work. Mod gl^t on all –
Dif Nil On 20.000

116. Oxalate Quinine. R. Very High H. Lowest — Platina Richly on Aluminium P. gk On all but Zinc & Plat. Plat. Lowest. O. gk on all but Plat. — Moderately slow — Dif Nil on 20,000

117. Oxalate Magnesia. R. Mod Low. H. Lowest on Platina P. gk. O. Mod. gk. D. Nil on 20000

118. Lupulin. R. High H. Highest on Alumin — Lowest — Zinc Very Low } P. gk On all of Sec Plates — Mod. gk. O. Nil for gk — Dif Very Quick 20000. No obs — Nil.

119. Valerianate Zinc. R. Low. H. Variously Zinc High Slightly } P. gk On all — O. more slowly, Other Sub. Plat. Nearly Del Slips on O. Dif Low Big 20000 Mil.

120 Chloride Cobalt. R. Low H. Eve. P. Variable gk on Zinc Silver & Copper — Others Forming, Flat off more — O. gk. None on many. Dif 600. Great. Notice that by rubbing Paper gently with Hot Platina — Dif is more marked —

Notice that at Moment of opening Normal Friction of Paper is greatly Increased — on 20,000 No Dif.

121. Tannate of Quinine. R. High H. Eve. P. gk. O. None — Silver None — Big Sec of Rs in Paper When on Glass & O. — Very Orange Dif 600 Nil Except on Silver — weak

122. Borate Baryta. R. High H. Eve. P. gk On all but Plat & Glass — Least — O. gk. Dif Nil ok on 600.

123. Picrotoxin. R. Mod Low. H. Variously P. gk On all Dif Nil

124. Carmine. R. High H. — P. Dech. P. Slower Bleaches Color on O. D. Nil.

125 Prot. Acetate Copper. R. Low R. Platina Low. Aluminium High P. Dech. P. Ditto Dif O.

126 Nitro Prusside Soda. R. Low O. Platina Low. Tin Next Aluminium High. P. Dech. Sec Platina — Slow P. Not Quite so rapid D. Fric Inc. on O. — Nearly Noticeable on 600.

127 Iodide Iron. R. High H. Eve P. gk — & Platina — & Slow — P. & Slow on all — D. Nil on 600 Obs.

128 Sulphate Cerium Normal Friction of Paper Sec Small — R. High R. Eve — P. Dech. Exp on Silver. P. Ditto Friction Enormous on O. when Dried Tried & Moistened Nil on K.

129. Acetate Strontia R. Low R. Aluminium High Platina Low P. Quick for. P. Little Faster D. on 600 Slips Strongly on O. But little more on K. Nil on Zinc

130. Iodide Calcium R. Low R. Eve. P. gk on all Sec Silver & Copper — Dech on these — P. app. None Sec On Silver & Copper — Slowly — D. Nil on 20,000

131 Cyanide of Silver R. High R. Platina Low. Aluminium High P. Dech. P. Ditto D. 600 My Strong Zinc Tin & Platy Nothing at all on Alum. Weak on Glass Weaker on Copper — D. Nil. On 20,000 Obs.

132. Orpiment Barium R. High R. Zinc & Plat Low. Alum. High. P. gk. P. Ditto D. 600 Great Sec of Fric on Aluminium Mind Neg. on others. Necessary to Freeze Paint over the Paper

133

Sulphate Vinali Soda R^d Low. R^a Low. R^a Low Platin. R^a High Aluminum
P^d Es slow. None on Platin. P^d Very slow. but
(Rev. of Paper On Alum. High on R. Very Low on O.)
– Mod. gk on Platin – reserve upon opinion
Dif Fair on 20000

134

Acetate of Nickel R^d Low. R^a Nickel R^a – Paper adhere
P^d gk on all. P^a Sat. D. too Toxic
Sec. Enormously – Slips slightly on O –
D. Not good on 20000 –

135.

Sulphocyanide of Potassium } R^d Low. R^a But Low Tonic High P^d None on Alum
Sat on Nickel Slow on Zinc Slow on Tin None on
Plat. Sat on Silver Very Quick on Copper Slow on
Lead. P^d None on Alum – None on Nickel
& the Other Metals. D. too strong 20000 fair
Gives a Red Mark On Ox –

136.

Iodide } R^d Very Low. R^a High Alum. Slow Copper & Lead.
Low on Platin. P^d Sat. On all but Platin
Aff. None – P^a Slow Aluminum Slow on
Nickel Zinc Tin Platin – gk on Silver
(Rev. of Paper gk) – Quick On Copper – D. on Low.
Very strong 20000 Get it –

137.

Chloride of Aluminum } R^d Low. R^a Low Platin. High Aluminum P^d Sat.
P^a Sat on all – D. too very strong Not fair Test
138

Cyanide Barium } R^d Low. R^a Low Platin. High Alum (Enormous) P^d Sat
P^a gk on Alum Nickel Zinc. Slow on Tin
Mod on Platin Little faint Copper Very slow
On Lead. Slips slightly On Ox. D. on too
Quite strong, Not On 20000

138

Sulphate of Aluminum R^d Low R^a Enor. P^d gk on alum. Very slow on
Nickel or Zinc D. Tin None on Platin Sensibly any
On Silver gk on Copper & Lead – P^a Above
Alum. Nickel Zinc Tin on Platin Slow Platin. gk on Silver. Copper & Lead
Lead – Bad on Ox.

Diff on too great. A 20000 slight on aluminum
Nickel & Copper —

139.

Hypo Phosphate of Quinine } R^d Mod Low R^a High Alum. Low Platin. P^d R^a Dif Det the tin
P^a Enormous. Scarcely any passing thro. Alum. White
heavy Current passes through Platin. – P^d Sat.
On all – P^a gk on all – Sec. Toxic on O.
D. on too. Good. 20000 pitch fell 40000
Still fell.

#

140

Sulphite of Coppers } R^d Mod low. R^a High Alum low lead others Enorm –
P^a Speak slow on Platin – slow on others P^a Sat. on Alum
Nickel Zinc Tin Platin. Weaker but Sat on Silver
Copper & Lead – D. Too great on 600. Strong on 20000 & 40000
Sec. Fraction on O.

141

Cyanide of Potassium } R^d Very low. R^a Low Platin. High Alum, Zinc.
P^a Sat on Alum. Nickel Zinc Tin. & Slow Wood on Tin
Sat on Silver Copper & Lead. P^a Sat on Alum
Nickel Zinc Tin Slow on Platin Sat on Silver
Copper & Lead. Slight slip on Ox.
D. Big on 600, Good to get on 20000

142

Bi Sulphite of Soda } R^d Hyp R^a Low. Plat. P^d Slow on Alum. Nickel Zinc Tin
P^a Slow on Platin. Same so Silver Sat. on Copper.
Never under change in adjustment of Relay
Which gave above result – not proper Test – go
back to original adjustment as New as a
P^a Alum gk Zinc slow Tin slow. Nickel Very Slow Platin Slow
Copper none. Lead very slow. D. too Enormous Not on O.
D. Not get it on 20.000 –

143.

Pro. Chloride of Tin } R^d Low. (Paper very heavy up) R^a Variable
P^a – P^a gk on all – Phenomenon. P^a gk on all
Silver Plate Not very gk goes into earnest & [illegible]
Resistance Moves to fresh spot reserve Polarization
Gives Black Mark – which means apparently Enormous Conductivity
D. Not on 20000 Normal Fric. of Paper. D. Greater – [illegible]

144

Chloride of Cadmium { R^d Low. R^th Even. P^th Show on Alum. Nickel Zinc Very Show Tin. P^d Show show Tin Platina Silver Copper Lead – Show Black Mottled O. Nonacid Fresh great strength Decreasing fries. On O. D. Strong on Coo. Nil on 20000 –

145.

Sulphate of Ammonia { R^d Low R^th Lower Tin Platina High on Alum. P^th Just on Alum Nickel Zinc Tin Platina Silver Very Copper Do. Lead Show P^d Show Alum Nickel. Hy Zinc. gk Tin Just Platina Show Silver gk Copper. Show Lead – Nothing On Dy. D. weak on Coo Nil on 20000 –

146.

Benzoic Acid { R^d Mod Low. R^th Very High on Alum. Silver Low Zinc Tin & Platina P^th Just on Alum Nickel Show Zinc. Tin Platin. Just Silver Copper & Lead. P^d gk Alum Nickel Zinc Quantity show on Tin. Show Platina gk Silver Copper Show on Lead – D. Nothing on O. – A. Strong on Coo Strong on 20000 about as strong on 40000

147.

Sulphate of Morphia { R^d Low. R^th Low Platina High Alum. P^th Just Alum Nickel Zinc Tin Platina Silver Copper & Lead – Just recover P^d Just Alum Nickel Zinc Tin Platin – Show on Silver Just Copper Lead. D. Nil on O. Very strong on A. on Platina Silver & Copper on Coo. Fair on 20000

148

Acetate of Lead { R^d Low. R^th Pretty Even. P^th Just Alum. Show Nickel Just Zinc Show Tin Very Show Platina Black Mottled Apparently Mottled. Just on Silver Show on Copper –

Rheum By putting point of Flat Pen lightly on Lead – the Platinum diminishes allowing Current to pass Very Black mark left – This decreases in res. & very marked P^th Just Alum. Do Nickel Zinc Tin Platina Apparently Work on Lead – Act Arrangements – D. Paper rough. Nothing on O. A. Quite strong on Coo. Can't feel on 20000

149

Cornine { R^d Mod. Low. R^th Low Nickel & Copper – P^th gk on Alum Just Nickel Zinc Tin Platina Silver Copper. Lead. P^d Show on Alum. Nickel gk Zinc Tin Platina Silver Very Show on Copper Show on Lead – D^y Nothing A^th Strong on Platina on Coo. Ohms Campick feel it on 20000 ohms –

150

Sulphate of Ammonia { R^d Low R^th Low on all but Alum. P^th Just Alum Nickel Zinc Tin Platina Silver Copper Lead. P^d Just on Alum Nickel Zinc Tin Platina Silver Copper Show Cleanest & Sharpest Polarization Just noticed D^y Nothing Normal Fric growth – D^th Very weak on Coo. Nil on 20000

151

Sulphate of Strychnia { R^d Low. R^th Lowest Zinc Highest Silver P^th Show Alum. gk Nickel quite Low Zinc Just Tin Platina Extra Just on Silver. Just on Copper & Lead. P^d Just on Alum Nickel Zinc Tin Platina Silver Copper & Lead D^y Nil. D^th weak on Coo. Nothing on 20000 –

152

Chloride of Strontia { R^d Low. R^th Marks Even. Alum. High if any – P^th Show On Alum. gk on Nickel Zinc Hy. on Tin – Slower On Platina Just on Silver Copper & Lead. P^d Very show on Alum. gk Nice on Nickel Show on Zinc Tin Platina Silver Copper & Lead D^y Slight Slip – D^th Very strong on Coo. Nil on 20000

153

Chloride of Magnesia { R^d Low R^th Alum High. Low Platina Sil. & Cop. P^th Just Alum Nickel Zinc Tin Silver Copper & Lead P^d Just Do Do & Do Show Very fast Quick D^y Slips On A Slightly D^th Hardly any On Coo Nothing on 20000 Grey Brown Mark on Hy

154. Fluoride of Sodium #

Rd Low. Rm about Same
Pd Gh Alum. Nickel Zinc Tin Platinum Just & very great Effer Dy
Po Slow " " " " " Silver Gh Copper Lead
Do Slip quite strong on Platinum Faint on Others
Dd Effer Great on Coo. Quite strong on 20.000
Equally strong on all on 40.000
Normal Price of Paper appears to be quite great passing over silver — Silver See Tris on O. through 40.000 quite plain - Also on Lead probably Platinum Also notice it on Zinc & thick & increases on N. on Lead thro 40.000 But much weaker than on O.

155. Nitrate of Zinc -

Rd High. Rm Slight Difference
Pd Just. Alum Nickel Zinc Tin Platinum Silver Copper Lead -
Po " " " " " " " "
Do Slips slightly on all Except plus - Eff. Dec. Friction -
Dd Strong on Coo Nil on 20.000

156. Baptisia

Rd Mod. Rm Low Copper Zinc High Alum.
Pd Just. Alum. Nickel Zinc Tin Platinum Silver Copper Lead
Po " " " " " " " "
Do Imperfect Friction -
Dd Coo Rather weak. 20000 Platinum Slightly

#

157. Sesquic Chloride Cromium

Rd High. Rm Low Platinum High Alum & Lead. Dif Very Marked.
Note Band Pass across Platinum with Velocity & Closes Below Clear & Sharp. Extraordinary
Note Paper gets Dry quite rapidly
Pd Just. Alum. Nickel Tin Wood Current & Bridge Do Zinc Slowly on Tin Just on Platinum Silver - Copper Doubtful Do Lead.

Dried up

158 Benzoate Soda - #

Rd Extr Variable. Rm Very High on Copper & Alum Ec. Low On Plat. Greatest Dif yet noticed but not sharp like No 157 =
Pd Extraordinary Instantaneous Almost Insulation on all Except Platinum - Note what ever on it. As Paper Dries it gives Sharper action as in 157.
Po Quick Alum. Nickel Zinc Platinum Copper Silver & Lead.
Do Inc Friction
Dd Very great on Tin & Platinum - Fair on 40000 Quite strong on 20000

159. Bi: Chloride Mercury

Rd Low Rm Alum High Platinum Low. Sharp closing in from Rd
Pd Just on Alum. Nickel Zinc Tin Platinum Silver Copper Lead
Po " " " " " " Slow " Slow " Up "
Do Nothing
Dd Great on Coo. Quite strong on Alum & Nickel on 20000 Fair on 40000 Nickel

160. Salicine #

Rd Low. Rm Even on all but Alum. High.
Pd Just. A. N. Z. T. P. S. C. L
Po " " " " " " " "
Do Nil.
Dd Great on Coo. Quite strong on 20000 on Zinc Equally on 40000 on Zinc. Platinum not as good as Zinc -

161. Pyro. Phosphate Soda

Rd Very low. Rm Rather Even High on N. & A.
Pd Just on A. N. Z. T. Little Slower on P. Ok on S. Just on C. & L
Po Quick on All -
Do Nothing Dd Ex. Strong on Coo. Good on 20.000 Rather weak on 40.000 —

162. Phosphate of Calcium

Rd Low. Rm Lowest on P. Z. & T. High on L
Pd Just on A. N. Z. T. P. S. C. & L
Po " " A. N. Z. T. P. S. C. & L
Do Nothing. Dd Mod. on Coo. Nil on 20.000

163 Tartrate Iron

R^d very Low. R^m Even.
P^t Inst. A. N. Z. T. P. S. C. L.
P^o " " " " " " "
S^o Nothing. St Aff. Inactivity on Coo. Weak - but grow
Now shows Dif on O. Cant say if Inc or Dec.

164 Benzoate Ammonia

R^d Low. R^m Even. Low on Platina.
P^t Inst. A. N. Z. T. P. S. C. & L.
P^o " " " " " " " "
S^o Alps Slightly. St Gelts weak on Coo Nil on 20.000.

165 Carbonate Ammonia

R^d High. R^m Even
P^t Inst. A. N. Z. T. P. S. C. & L.
P^o OK " " " " " " "
S^o Ex. Spring Fric. at moment of closing. Insuch. Coos.
St Very Weak on Coo. Nil on 20.000

166. Sulphate Carbolic Lime

R^d very High. R^m about Even
P^t Inst. A. N. Z. T. P. S. C & L
P^o OK
S^o Inc. Slightly. St Hard to detect on Coo.

167. Chloride Barium

R^d Low. R^m Even
P^t Gt slow A. N. Z. Tolerable T. Slow Sph. Coo L Da
P^o " " " N. Bar - Z. Same Tsame Psame Sph. C. Slow Sph. Slow
S^o. Cant define action - St Mod. spring on Coo. Mod. 20.000 on Z. Inc.

168. Nitrate Uranium & Potash

R^d Low. R^m Ex. Variable Platina low.
P^t Gt on A. N. Z. T. Not a P. Gt B. Paper Dry on Copper & Lead
P^o Inst. " " " "
S^o Gt spring Slip on O. S^t Gt. Nf on Coo. Gt it on 20.000

169. Chloride Lead

R^d Low. R^m Very Slight Dif
P^t Inst on A. N. Z. T. P. S. C. & L.
P^o " " " " " " " "
S^o Nil S^t Gt spring on Coo. Get it on 20.000.

170. Gallate of Ammonia

R^d Very Low. R^m High on A. & L. Low on P.
P^t Inst on A. N. Z. T. P. S. C. & L.
P^o " " " " Slow T gt P. Slow S. C. & L.
S^o Enormous Inc. & S^t Gt. Dif on Coo. Get it on 20. Barely in Slow.

171 Chloride Morphia

R^d Moderate R^m Short Closing on P. High on A.
P^t Inst on A. N. Z. T. P. S. C. & L. Last 3. Extra
P^o " " " " " " " "
S^o Nil - St Mod spring on Coo. Cant get it on 20.000

172 Lactate Iron -

R^d Rather High R^m High on A. Low on Z.
P^t Inst. on A. N. Z. T. P. S. C. & L
P^o " " " " " " "
S^o Slight - St Barely any on Coo.

173. Oxalate Potash

R^d very Low. R^m Platina Low. Copper Inverted - Dif well defined
P^t Inst on A. N. Z. T. Zero P. Inst S. C. Zero L
P^o Mag on " " "

Note. Noticeable Red. of Even on O. & the reduction of the C. Current in its passage through the solution upon use the Metals is much less than it is upon K. By turning off Spring of Relay Relay is detached through the gauge in Board in proportion to the current.

P^o Slow on A. N. Z. T. Slow P. S. C. & L.

Dry

Note To explain these peculiarities we wish to state that Polarization is not so well defined as when Spring is long Resistance through current & Cure only be collected by getting a

Higher adjustment of the Relay
Since the terms Gk. Slow. & Instantaneous are not absolute but simply
Determine the relative proportions
of Polarization upon that adjustment
& also tested to show any very decided
Difference - The absolute determination
of the Polarization can only be had
by Means of a Wheatstone Bridge -

174 Iodide Sodium

Rd Leg. Rm Leg Platina High silver
Pk Slowly on all
Po Moderately " " Do Inc. Dk Great on 600.
Quite strong on 20000 - Get it plain on 40000

175. Amonia Citrate

Rd Very low. Rm Lead High.
Pk Gk On all. Do Cant define action
Po " " " Dk Dont feel Inc on 20,000

176. Acetate of Zinc

Rd Low. Rm High Al. Low Tin.
Pk Slow on all But C & L. odd. none on Tin
Po. on A. almost from Zero to Absolute Insulation.
- Slow on N. very slow on Z. gk on T. P. S. Slow on C. & L.
Had to turn up adjust to show it on last H
Do Decreases Dk None on 600 ohms -

177. Bisulphate Soda.

Rd Low - Rm Low on P. High on A.
Pk Mod Slow on all But lead (Spring High) None
Po Slight A. N. Slow T. T. P. Po. S. None Copper & L.
Do Cant Do it. Dk Slight on 600. Nil on 20,000

178. Citrate Magnesia

Rd Quite High. Rm Low.
Pk gk on A. N. Z. T. P. S. C. & L
Po Slow - A. N. Z. T. P. S. C. & Very on L.
Do Nothing Dk Slight on 600. Nil on 20,000

179. Acetate Magnesia

Rd Low. Rm High on A. Low on P.
Pk gk on all Ro Count Define it
Po " " " Dk. Very light on 600. Nil on 20,000

180. Chlorate Soda.

Rd Low. Rm Even.
Pk Slight on A. N. Z. T. P. Dest. S. Slow on C. & L.
Po Very " " " Barely any on N. Slow on Z. T. Extremely slight on P.
Do Nothing Dk Great on 600. Fair on 20,000

Quit for Tonight - E. Hoskin -

- 4 AM Aug 26th 1876 -

181 Borat of Copper

Rd Low. Rm High on A. & L. Rich Low.
Pk Slow on A. N. Z. T. gk & P. Slow S. gk C. & L
Po " " gk N. Z. T. Dest P. S. Slow C. gk L.
Do Nil - " Dk Mod. on 600. Detect it on 20,000 on S. only -

182. Chromate Potash

Rd Low. Rm Even
Pk None on A. N. Slow Z. None T. P. Dest S. None So C. None L.
Po " " " " Z. T. P. Vy slow S. C. L.
Do Quite Slippery Dk Strong On 600. Nil on 20,000

183. Tartrate Magnesia

Rd High. Rm Lowest On L & P. High on A. & L.
Pk gk On A. N. Z. T. P. S. C. L.
Po " " " Dest N. Z. T. P. S. C. L.
Do Dont know. Dk Strong on 600 - Get it on 20,000
Probably on 40,000

184. Magnesate Sodium

Rl Low. Rm Rather Abnm. High on A. & L. Low on others
Ph Slow on A. gk on N. L. T. None on P. Stores on S. Best C. L.
Po Very " " A. N. L. T. P. S. C. L.
Dc Inc. Strength. Dh Strong On 600 Nil On 20,000

185. Phosphate Lime

Rl High Very Rm Too High to find Variation
Ph gk on A. Best N. L. T. & slow & slight on P. S. gk on C. Best L.
Pc Slow on A. N. L. T. Best P. S. C. & slow on L.
Dc Slight change of some Sorts. Dh Meat on 600. Quite Plain On Nilon On 20,000 Nil On 40,000

186. Acetate of Lime #

Rl Low. Rm High on A. L. S. & L. Low on P. & C.
Ph Slow on A. M. L. gk T. Best P. Very Best on S. Best C. L.
Po gk on A. N. Best L. T. Slow on P. gk S. Best C. L.
Dc Slips Strong. Dh Quite Strong on 600, Strong on 20,000 Quite Strong On 40,000

187. Acetate Cobalt -

Rl Low. Rm High on A. Low on Others -
Ph gk on A. N. L. T. P. S. C. & L.
Po " " " " " " " "
Dc Feel something. Dh Nothing -

Aug 30/76

188 Sulphate of Aniline

Rl Low. Rm Pretty Even
Ph gk on all Dc Nil On 600
Po gk on all Dh Good on 600 Nil on 20,000
Violet Mark On O. Quite sensitive On 600 Mod. on 20,000

189. Salicylic Acid

Rl Very High. Rm High on A. Best L. Best T. Best L. - Low on Others T. Low
Ph Ok on all Po Ok on all.
Dc Inc. Tric Strongly On P. S. & C. Others weaker -
Dh Meat on 600 Nil On 20,000

190 Hypo Phosphate of Ammonia #

Rl Very Low. Rm Nearly even. High on A. Low on T.
Ph Mt. Slow on P. gk S. Others rather gk. Except Slow Mrs. Nor. Best.
Po Very slowly on all - Dc Slips. Dh Inc Tric on 600. Nil On 20,000
Action on Silver Very quick - Sometimes insulates itself - makes Sots - on Plates
Small chips of Phosphorus & ammonia -

191 Prot. Iodide of Iron -

Rl Mod. High Rm High on L. Very High on A. Low on Others Platina Low each.
Ph Best. On all. Po gk on all. Platina Best. Dc Slips. Dh Strong on Low Very on Average only. Fail to Mark

192. Iodide of Barium

Rl Mod. High. Rm Even.
Ph Ok slow on but S. C. L. gk on these -
Po Slow on all. Thermom. Dark weak on, gradually as in Other Potassiums but Makes 4 sots full Strength, then Cease abruptly -
Dc Nil. Dh Very small on 600. Get something On 20,000 Gives Iodine mark on O. Bleached out on Ny.

193 Nitrate of Lime

Rl Very High. Rm Rather Even
Ph gk on all. Po Ditto. Dc Slips Dh Meat on 600 Nil on 20,000

194. Oxalic Acid #

Rl Very High Rm Too High & Tech.
Ph Too High & get Tolerinyhlin Po Ditto
Dc Inc Tric Enormously.
Dh Very Strong Strength 40,000 } Book these on O.
Dc Inc Tric on 600 weak. No weaker on 40,000

195. Mannite

Rl Very High Rm Quite weak Cant tell
Ph Quick. Po Variable Too weak to Get Definite Tech.
Dc Nil. Dh Meat on 600. Get it On 20,000

196. Valerianate of Morphine

Rl Ex High. Rm Even as far as can tell
Ph Ok. Too weak to detect. Dc Slips Strongly on 600. Don't Get
Dh Slips Rather Dif on 600 Nil On 20,000

197. Glycos col.

Rd Very High. Rm Tro High to Detect
Pk Tro High to Iron Poly. Dilto on Po +
Do Slip. Spring on 600 Nil on 20000 Dilto on N.

198. Arsenic Hydrate

Rd Very High Rm Cant give Charges
Pk Po Cant bring the charges
Do Nil. Dk Nil on N.

199. Chloride of Magnesium

Rd Very High Rm Cant give it = Lots P. High on A.
Pk Very quick on A + L. gk on T. Others Mark Nil.
Do Dash felt something Dk Spring on 600 Nil on 20.000.

200. Sulphuret of Baldium

Rd Mod. Low. Rm Vy High on A.N. Low L. High T. Vy low T. S. C. + L.
Pk Dash on all. Po Slow on all but S. + G. Dm Same as Vy slow on L.
Do See on A. + Z. T. Dc. On others (apparently)
Dk Very weak on 600. Nil on 20.000

201 Asperagin.

Rd Mod. Rm High on A. L. Low on others
Pk Vy Dash on all Exp Plating
Po Slower - Do Nil. Dk Felt it on 600.

202. Chloride of Zinc #

Rd Ex Low. Rm Even.
Pk Slow, Nil full, Current up to point of abrupt Plating stop
Po - Same thing On A. N. Much slower on Z. T. Vy gk on T. S. C. L.
I believe the slower Odor noticed in Phosphate + this is due entirely to Oxyne. Do 30 - 1 is Vy strong
Do + Dk Nil - The Oxyne reaction is strong on P. + S.
Oxyne makes a Reddish Nil on O. which shades —

203. Phosphomolybdenic acid

Rd Mod. Low. Rm low on T. High on A. Other Pretty High
Pk abs. Dash. Po Slower a trifle. (One Dot on N. L. on O.)
Do Nil. Dk Ex Strong on 600. Normal Fric greatest it normal
Opening Fair on S. C. on 20000 Nil on 40000

204 Sulphate Bebasin

Rd Ex. High. Rm Lowest on S.
Pk gk On all. Dm
Po gk on A. N. Z. T. Dash on P. Slow on S. Much on C. L.
Do something Dk Very weak on 600. Nil on 20000

205. Bromide of Mercury.

Rd Low. Rm Very low on T. High on A. Mod. High on S. C. Low on T.
Pk Dash on A. N. Z. T. P. S. C. L
Po " " " " " " " "
Do Nil. Dk Ex Strong on 600. Barely felt it on 20.000

206. Iodide of Cadmium

Rd Very Low Rm High on A. N. L. low on others
Pk Ok on all But T. + S. Slow on these abrupt when it crosses
Po Dash on all Do Nil. Dk Nil Ex. on C. gk strong on 600 Nil on 20000

207 Nitrate of Lime

Rd Very low. Rm Even. Super addition to Plating
Pk Quick On all —
Po Gk none on A. N. Z. T. Nil on P. S. Slow on C. Slow on L.
Do Nil. Dk Weak on 600 Nil on 20,000

208. Anthracite of Potash #

Rd Low. Rm low on P. High on A. + L.
Pk Very slow on A. Just N. Z. T. Nil on P. gk on S. Dash on C. + L.
Po Quick on A. by stars N. Z. T. Slow T. S. C. L.
Do Gk slight Dc + Dk Ex Enormous. Reverse action + Dc
Fric very strong on 20,000 + other more marked on 40,000

209. Phosphate of Magnesia

Rd Mod High Rm High T in low P. Others Med.
Pk Dash. abs. Po nearly So —
Do Nothing Dk Ok strong on 600. Felt it on 40000. MK

210. Chloral Hydrate

Rd Mod Low. Rm High on A. N. T. Z. Vy low on P. Known MK on O.
Pk gk A N Z T Vy low P. gk S. C. L. Po gk A. Slow N. Z. gk T. P. Slow S. C.
Do Nothing Dk Weak on 600 Nil on 20,000 Oxyne gives

211. Lactic Acid

R^d Mod Low. R^m Nearly even. A high Flow
P^h gl on all but T. Show abright & variable -
P^o Flower on all. P. quite low.
S^o Nil. S^d Weak on 600 Nil on 20000 Sf. Bk Nil on N. Silver

212. Molybdaenic Acid.

R^d Quit. Low. R^m Even. P^h Abt. Such. P^o Pink & mauve.
S^o Nil. S^d Very weak on 600. Nil on 20000

213. Citronic Magnesia

R^d Vy. Low. R^m Like Low. High on A. N. & rather High on P. & other
P^h Not mall. P^o Not mall but S. & C. gl on Three S^o Sec. Tric.
S^d Strong on 600. Barely fail on 20,000

214. Pyro Lignous Acid

R^d Vy High. R^m Low Z. High Others
P^h Not on all no S. Shows the Sec. of Rec. on passage of current, and
an anonymous lower Polarization
P^o gl on all exc. L. Sec show on L.
S^o Nil. S^d Nil on 600 Nil sec. on L. Nil on 20000

215. Tartaric Acid.

R^d Mod low. R^m High on A. L. C. S. Low. P. Z. T.
P^h Not on all. Except S. Best Nearly Anonymous Poly
P^o gl on A. Show on Z. gl T. P. S. C. L.
S^o Nil. S^d Weak on 600. Barely any on 20,000

216 Sesquichloride Iron.

R^d Very low R^m low on all - slightly higher on A.
P^h Enormous Poly & Very Not. on all.
P^o Not on all Exc. S. C. L.
S^o Nil. Dif on Either Only

217. Disulphate of Copper -

R^d Low R^m Low on all but S. C. L. High -
P^h Great on all. P^o Show on A. N. Vy show Z. T. Not. P. gl on S. Not C. L.
S^o Nil. S^d Nil -
Poly is Enormous with Not & Pleasure. Platin Coated with Copper

218 Gum Tragacanth

R^d Mod Low. R^m High on L. C. Vy show on Z. & P. Gives 2 Dots on Showing
Over the Whole Pic
P^h gl on all - P^o Ditto
S^o Nil. S^d Vy strong on 600. Nil on 20,000

219 Arsenous acid.

R^d Low. R^m Low on P.
P^h Not. on all. P^o Not.
S^o Nil. S^d Very little on 600. Just fail it on 20,000

220. ~~Sulphurous~~ Palate of Ammonia

R^d Vy Low R^m low on N. & P. Makes 2 Dots in running the Mixture
P^h Not & Great. P^o Show A & N. Vy show Z. T. gl T. & show on S.
Not C. L. show L.
S^o Small. S^d Weak on 600. Just it on 20. Nearly as strong as
221 Gum. Dextrine

R^d Very High. R^m low on P.
P^h Not on all - P^o gl on A. N. Show on Z. gl T. P. Not S. C. Not
S^o Nil. S^d ~~gl~~ strong on 600. Fair on 20000 Ditto 40,000

222. Sulphuret of Calcium

R^d Low. R^m Fairly Even. P^h Poly mall. P^o Ritz gl A. N. Z. gl T. Not P. C.
S^d Strong on 600, Fair 20000 Just it on 40,000 Show -
S^o Nil

223 Sulphuret of Antimony

R^d Mod. High. R^m Lowest on S. Rather even -
P^h Not. Great. P^o Ditto Slightly Stronger.
S^o Nothing. S^d Mod strong on 600. Nil on 20,000

224. Nitrate of Lead.

R^d Very Low. R^m Even. P^h Very show & strong on A. N. Z. T. Not gives p. show on T. - On S. Sudden & acc
Announced by Dots at moment of Polarization. Same Phenom. on Copper & Lead
P^o Not on A. Rose on N. Vy Show on Z. T. P. & show on Glass. Copper & Lead
Black Mk. - Poly not sudden on O. S^o Nil. S^d Nil

225. Gum Guiac & Caustic Potash

R^d Low on T. High C. & Va. P^h Not. P^o Ditto
R^d Low S^o Nil. S^d Vy great on 600. quite strong on 20,000.
Equally so on 40,000

226. Caustic Soda Gum Gamboge

R^d Low. R^m High on A. N.
P^d Gd a v st. Bish. L. T. Nil P. Ty flow a. S. Bish. C. L.
P^o Gd A. N. L. T. T. S. C. L.
D^o Nil. D^t Enormous on 600. Strong on 20.000 & strong on 40...
Think it as good as Acetate of Mercury –

227. Gum Guiac #

R^d High – R^m Highest A.
P^d Bish on all. P^o Bish on all – Light Blue. Not as A.
D^o Nil. D^t Enormous on 600. Fish it strong (on Trial) on 20.000
Nearly as strong on 40.000 very fair –
Combine this with the Solutions giving the Orange Green – for Platina Solution. #

228 – Caustic Potash Gamboge –

R^d Ty Low. R^m Pretty Low – P^d Gd on all but P. slow.
Notice this paper being quite wet. You should cut on
1st closing – #
P^o abs. Bish. Ty. Great. D^o Enormous Inc. Fric –
D^t Ty Gd. on 600. Ty strong on 20.000 strong on 40.000

229. Caustic Soda – Paper Wet.

R^d – & Low. R^m
Paper So wet. Res. So low. Cant Detect Poles –
D^o Slips strongly D^t Not so great – as normal Fric
is low. Pretty good on 20.000 Very Faint on
40.000

230. Gum Guiac & Caustic Potash

R Very Low R^m Low on P. Nitro. o Sat.
P^d Best on all Ex^d P. little slower
P^o Bish on all. Inc Fric Greatly on A
D^t Enormous on 600. Gt strong on 20. & strong on 40.000

231. Glycerine

R^d Mid. High. R^m Low on P. High on A.
P^d Gd on all. P^o Ditto
D^o Nil. D^t Barely get it on 600

232. Gum Sulphur & Caustic Potash.

R^d Low. R^m High on S. A. Low. Z. P. & T.
P^d Best on all P^o Good.
D^o Inc Fric – D^t Fairly strong on 600. Just full it on 20.000

233. Balsam Copaiba & Caustic Soda –

R^d Low. R^m Variable hard to determine
P^d Best on all. P^o Ditto D^o Slips gt strong – D^t strong on 600.
Gt strong on 20.000 strong on 40.000

234. Balsam Copaiba & Caustic Potash

R^d Low. R^m Low on Z others most even –
P^d Best on all – P^o Ditto
D^o Slips on A. D^t Great on 600. Strong on 20. Nearly gt strong

235. Venice Turpentine Caustic Potash

R^d Low. R^m Low Z. High on A. & C.
P^d Best on all. P^o Ditto – D^t Slips. D^t strong 600. Fair on 20.000
Just get it on 40.000

236. Gum Senegal Caustic Potash

R^d Low. R^m Level on P. Nitro Sat on Paper
P^d Best. P^o Ditto. D^o Nil. D^t Ty strong on 600.
strong on 20.000 Just full it on 40.000

237. Gum Gamboge –

R^d Very Low. R^m Low as on Z.
P^d Best on all. P^o Slower on all –
D^o Nil. D^t Weak on 600. Fair on 20. Cant get 40.000

238. Gum Benzoin & Caustic Potash

R^d Ty Low. R^m Low on P. Most on Z. High on A.
P^d Best on all – It breaks quick
P^o Ditto. D^o Nil. D^t strong on 600 Fair on 20.000 Gt 40.000

239. Balsam Tolu & Caustic Potash

R^d Ty Low. R^m Low Flat Next Z. Highest on A. Next L & C.
P^d Best on all. P^o Ty Bish. Inc Fric. D^o Mod strong on 600
Just get it on 20.000

24

240 Gum Sandarac & Caustic Potash

R^d Yellow. R^m Low Pretty Even
P^h Dark on all P^o Ditto
D^o Mt. Fric Slight. D^n Big Eos Coo Gh if on 20,000

241. Gum Myrrh & Caustic Potash

R^d Low. R^m Low P. High.
P^h Dark on all P^o Ditto
D^o Nil D^n Gh. on Coo Dark gah if on 20,000

242 Balsam Peru. & Caustic Potash

R^d Yellow. R^m Low Flat
P^h Dark on all. P^o Ditto
D^o Slip. D^n Strong on Coo. Gh if on 20,000

243 Gum Tragacanth Caustic Potash

R^d Low. R^m Flat Low. C. High.
P^h Dark on all. P^o Ditto.
D^o Nil. D^n Gh on Coo. Dark fel 20,000

244. Balsam Canada & C.P.

R^d Yellow R^m Low or P. High on T.
P^h Dark on all. P^o Ditto
D^o Mt. Fric Slight. D^n Gh on Coo. Fair on 20,000 on P. Cant fel on Hooed

245. Balsam Tolu.

R^d almost Insulation. R^m Low P. High A.
P^h Dark on all. P^o Slower on all
D^o Nil. D^n Quite Strong on Coo. Gh if on Copper & Glass On 20,000

246 – Per Tartrate Potash.

R^d Low. R^m Lowest on P. Makes Dot on Resorcin
Reject on alum
P^h Dark & Gy. P^o Slightly Slower.
D^o Nil –
D^n Fair on Coo
Fair – P. Strong on S. on 20,000

247. Benzoic Acid –

R^d Ex High. – R^m Even –
P^h Dark on all. P^o Slower on all.
D^o Nil D^n Quite Strong on Coo. Gh Strong on 20,000
Cant fel if on Hooed

248. Caustic Soda Strip Quite Dry

R^d Low. R^m Lowest on P. High on A.
P^h No Color on P.
D^o Enormous. Ex Strong on 20,000.
Exp^t Strong on 240,000 1st Class Red Ox

This Fills the Bill
Aug. 30th 1876

A. Brown

Correction of Bradley Rheostat with BA Elliott Bros Standard Rheostat, Bridge with Speaking galvanometer Mirror, 3 feet from Scale, 1 cell Carbon battery,

R of Bradley all plug pendings

	Coil	Forward Dot by Ear by measure or plugs values indicated in opposite	ohms Fraction only	Out
	10		10	
	20		18	2
	30			
	40		O/K	
	100			
5 Cells Carbon	200			
	300			
	400			
	1000	995		5
	2000	1990.		10
	3000	2985		15
	3000	2965		35
	2 Wind with long & one	2958		67. equal 6 cells
		65		Whole. 20 cells

2 cells Carbon Test, Same –

Total 70
67
75
3)212
Mean 70

Walter Bradley Coil A No28

Accurate test to within 1 ohm on large resistance

Large Mirror, 20 cells Carbon Battery.

Has a resistance of from 4 & 5 ohms plugged up.

Correct within 1/10 of an ohm to 300 coil

	300 —	298.3
	400	399
	1000	996.7
	2000	1989
1st	3000	2990
2nd	3000	2998.1
	9,700.	
		9631.1
		9700.0
		0069.1 = .69.1

Seperate actual

Total taken together 9631. — 69.

when 10,000. in dif 73 showing 3.9 dif in bal of Coil. ~~m~~

The initial Resistance all plugged up is only a fraction of an ohm Aug 31 1876 TAE.

=

Sept. 1. with 20 grain acetate Cobalt 100 CC H2O. you can plate Cobalt nicely on platina 20 cells through 1000 ohms

Electro Motograph. Continued - Sept 4 1876.

Pending the construction of an Instrument designed to present a new surface to the friction point so as to avoid the Effects of Polarization - the tests found on the preceding Pages were made having in view the attainment of the same object in a different way - viz - by feeding a Solution having great frictional Difference with a minimum of Polarization

Of the Results of the latter; record will follow —

Of the result of the Constantly Changing Surface - that is to say - the Instrument with Chalk Cylinder & travelling Pen we have only to record as yet that it fails of its purpose —

We now go back to the Chalk Sticks & Matrix Paint - & find certain results say 200 words per Min. on 5000 ohms nearly always obtainable but not reliable

We find that it is not Resistance that is required - but friction Created by the Chemical Solution in which the chalk is steeped - so that when the Current passes & this friction is neutralized by it the Normal friction of the chalk alone is active - this latter by reason of the use of but slight tension on the Springs being slight - the retractile Spring is left free to operate with great promptness.

We now proceed to Experiment with this apparatus

Keeping Mr Israel Chalfs in the Collections recommending themselves as efficient in the properties we require Viz

Strong Normal Friction upon Open Current.

& Complete Neutralization of same upon passage of Current through it -

Our previous Notion has been that our Normal Friction was to be obtained by great pressure on the Point -

We now find this is wrong - That we must have a Normal friction generated by the Chemicals alone & the end that it may be neutralized by the Current - & the Retractile Spring have only to overcome the light pressure of the Spring we are by this means enabled to use -

1

Caustic Soda. 2 Gr. Balsam Canada 5 Gr. Caustic Potash 2 Gr. 100 cc H2O No good -

2

5 Gr. Balsam Copaiba 1 Gr Caustic Potash - 100 cc H2O No good -

3

5 Gr. Gum Guiac 5 Gr Caustic Potash 100 cc H2O No good -

4

Caustic Potash - Gamboge. Liquid Mixture of Iron 100 cc H2O No good

5

8 Gr. Bi. Carbonate Soda. 100 cc H2O. No good.

6.

You led off into general Experiments with the point of the pen Med it should stopped thus - but found Fluff would collect underneath it & destroy action - Turned the same point perfectly upright thus ¬ - Also failed - then fitted it to a position at right angles thus ⊢ so that it travelled Edgewise - this apparently works very well - but may be found less effective than a point

Med on these various points various solutions of Gamboge Caustic Soda & Caustic Potash - as follows

Saturated Solution of Caustic Soda & Gamboge

Strong Sol. Caustic Soda - Alcohol & Gamboge.

Caustic Soda & Glycerine

& C Getting very fair results But not at all satisfactory -

We tried placing a piece of paper upon the Check - & found good results. Immediately - following these up & trying the paper on a solution of Caustic Soda & Gamboge working by nice adjustments we got 250 words per min & Perfect on 36.000 ohms - Good -

11 am - Sept 6 1876 -

We find great difference in Paper - Some papers giving good results others failing to operate at all -

All with a solution of 5 gr Caustic Soda 5 gr Gum Gamboge } working

Best Paper - & this time 11.30 am J. F. Cushman & Co. Chemical Labels Pink Highly Glazed Surface

Works well at 2 & 300 per min on 36.000 ohms

Apparently no False Sets -

Local Ckt Breaker does not have the Nibbling vibration when Ckt Open or Closed -

Phenomenon

To a solution of Bisulph Carbon & Spirit Turpentine Iodine is added, after several days, perhaps 2 weeks, the solution becomes colorless, I have just added a large quantity of Iodine, Sept 9 1876.

Phenomenon. Caustic Potash left in a solution of Bisulphide of Carbon for two or three weeks liquefies to an intense yellow syrupy solution, which gives the purple color with nitro prusside of sodium & is probably Potassic Sulphide whether there is new compound sequestrated

Phenomenon:
Spirit Turpentine }
Bisulphide Carbon } to which is added Crystals of Iodide Potassium after several weeks considerable quantity of Iodide dissolved & portion decomposed into free Iodine which colors solution reddish,

when Iodide is added to Spt Turpentine after several weeks the solution is colored reddish with the appearance of a syrupy heavy solution at bottom when bottle shaken these separate in fine globules they adhere to sides bottle but liquid runs down in streaks -

Phenomenon

Alcohol + Bisulphide ~~of~~ Carbon + Caustic Potash after several weeks Exceedingly fine needles like crystals, collect on bottom & around sides in considerable quantity = Potash disappears = what substance is it

Phenomenon

Alcohol + Mono-chloro-acetic acid, after two or 3 weeks very small quantity of precipitate like crystals. Collect on bottom + alcohol acquires an ethereal smell also something like acetone. & whisky

Oil Mirbane + Oil Sweet almonds, permanently cloudy - slight yellowish tinge, sun appears red through solution appears to have great power of showing prismatic colors

Alcohol + Iodide Potassium after 4 weeks I find 3 or 4 prismatic like crystals large & transparent - just like Mica 1/4 inch square; whether this is a crystal of some substance or something that gathers the bottle deposit & crystallizes out

Iodine + Iodine - after 2 or 3 weeks Iodine apparently dissolved with a solution of liquid redish. due to the formation of a sticky gum or pasty which globules on shaking bottle,

Creosote + Bisulphide Carbon; perfect mixture I think that addition of Creosote may possibly increase the prismatic power of the Bisulphide Carbon

Bisulph + Glacial Acetic Acid, - acid on top Carbon below - peculiarity is that around threads of the bottle & on bottom there are drops which have the appearance of an ice pitcher on a warm day (?) outside, or supposing no liquid were in the bottle. Object as if it had been washed & not wiped out — probably due to ~~gas~~ gas,

Oil Rosemary + Caustic Potash, latter after several weeks liquefies to a reddish solution = what is this new derivative =,

Phenomenon -

Strips of Ivory soaked in oil of Mirbane for six weeks becomes transparent Hard Rubber 1/8 inch becomes as limber as paper & very pliable = It would seem that some unknown substance had been dissolved out leaving nothing but a sponge of Carbon = = I find after 1 hour ivory returns to white color.

Oil Mirbane after 2 or 3 weeks semi dissolves & gradually softens like soap or Cocoanut oil

Spirits Turpentine & Iodine after 3 weeks a precipitate formed which clouded the turpentine, apparently a demulcitic

Hyposulphite Soda is apparently freely soluble in Spirits Turpentine, The Crystal of Hypo. after 3 or 4 weeks melts down to a liquid ~~when~~ when shaken some what clouds the liquid showing that it is not desiccated. The turpentine smell can be easily detected –

Phosphorus,

Benzene & Iodine after standing in bottle several weeks stain (probably superficially) the inside of glass: ~~take~~ dark brown solution so that that one can scarcely see through; perhaps there is a compound of Iodine with something from the Benzene

Iodine quite freely but can be easily scratched with any thing hard showing it to be only a layer or deposit.

Apparently Saturated Alcohol. Solution of Salicylic acid ~~is~~ great preservative power.

Turbine apparently dissolves Sulphur freely & its preservative power is greatly increased. I think there is something in it

& it may be found that certain liquids which dissolve Sulphur will have great spectral power dispersive –

Aniline Oil softens & makes hard rubber like Mirbane, but it does not touch or even dissolve Caoutchouc after 6 weeks' –

White Solution permanent.
Alcohol & Bichloride of Tin, permanently Clouds Alcohol & poisons –

Vapor of Iodine penetrates deeply into Beeswax for instance the wax around the glass stopper of an Iodine bottle became black clear through

Alcohol dissolves Glacial phosphoric acid after a long time 2 or 3 weeks apparently 2 sets of Crystals separate on Camphor spongelike the other long needles. ~~and the almost~~

In a Rain water Solution of Tartarate of Soda a jelly accumulates on the top ¼ inch thick even on a dilute sol what is the substance = Lupulin also to a lesser extent

in a solution 1 gram Amygdalin 100 cc HO.
a scale Crystal forms at bottom which
has the appearance of an Ocean shell
its shape like this
after the 2nd, Sol 3 weeks old

Sol Borate Baryta 1 gram 100 cc HO. a
Scale Crystal form. Inch square just like Mica

Sulphate Morphia 1 gm 100 cc HO. a needle
Crystal 1/12 thick inch half long form after 3 months

5 gm Sol of Cyanide Pot in 100 cc HO. in an
Calcium white 7 weeks but the 20 gr.
40 gm in 100 cc turns very red. replaced
6 days colors & blackish brown precipt
collect at bottom, what is the
Colored sub Cuprec =

5 gm 100 cc Benzoate Soda Collect a gelly
thick in 3 weeks, while the 20 gm 100 cc HO
does not. The 1 gm does but not
gelly 1/2 inch thick Collect on 100
gm Solution of Licorice

40 gm 100 cc each of ferrocyanide of Pot
& ferridcyanide give with platina
blue mark quick sensitive

40 gm 100 cc each ferro & ferricyanide Pot. Salt &
Gallic Acid, Blue on O. Red on H good.
slow double current paper

Sulphurous Acid Converts
Aniline Violet into Aniline Blue
or purple – but the Color
gradually goes

After with the Sulphurous Acid
turns it nearly white if solution
be filtered the paper dipped into it
is white, it gives an aniline Violet
mark on O. [illegible] but
paper turns violet [illegible] a minutes,
By [illegible] solution of
the Sol [illegible]
No mark
Made [illegible]

[illegible] – that the paper [illegible]
becomes Colored in [illegible] with
the Air. The Hydrogen paper not
[illegible] mark the Oxygen paper (9e)
the [illegible] Salt –

Discovery

When aniline oil is treated with Nitric
Acid (fuming) and then thrown into a large
quantity of HO. a precipitate takes place
and a yellow coloring matter dissolves
in the water, If this be filtered off
it may be enormously diluted without

destroying its delicacy to electrolysis.
A strip of paper be wet in the
Solution & gives on the Oxygen platinum
point a reddish mark, not very brilliant
rather dull, by 3 cell Carbon Cell, this marks turns
greenish. If you increase the resistance to
1000 ohm the mark is green when formed
20000 ohm may be used without any
material weakening of the mark = But
the most remarkable thing is that if the
Solution of Nitrate of lime & Chloride of
Calcium Good added no mark is obtained
at all or short circuit & it only commences
to appear after 2000 ohms have been
inserted and gradually increases in
sensitiveness until 10 or 12000 ohms
have been put in. The mark is seen at
20000. 1886 This is probably due
to the fact that with a certain battery
power the Nitrate of lime or Chloride
is decomposed & the Carbonate formed in the mark
and it is not until
the current is so weakened that
these substances are not decomposed that
that free oxygen is given off at point
& oxidizes the aniline. This opens a new
field in lithography, as we may by
Calcium Chloride Solutions, have a mark
1/2 of a Roman letter by a weak Current
& the other 1/2 by a strong Current & in
many other ways use it. Even in the
dot and dash for it can send a
strong Current to make the spaces
which will not record & with the
weaker Current of the state discharge
to record.

Sept 11th 1886 J. J. Edison

Good EMF Solution Sept 11 1886
J Edison

Note Aniline as described on last page
mixed with Chloride Calcium H O Solution
& neutralized so as to have excess Caustic
Soda = this decreases on 20 000 ohm
3 cell Carbon zinc platinum & increases on O,
mistake Cant ~~fall freely through~~ 20 000 ohms;

Cellulose Solvent = Sept 11 1886
J Edison

I placed some tissue paper in a bottle
containing crystals of Chloral hydrate three
weeks ago, having noticed that the Cork
Stoppers (which are Cellulose) were dissolved
by the vapors, I now find that a
portion of the paper is dissolved, at
least it has every appearance of it,
having agglutinized & is somewhat
transparent, while the Cork also thrown
in at the same time among the
crystals is unmistakably dissolved,
I took the paper out and put in a
test tube with alcohol, this didn't
appear to dissolve it more; heat it,
also put Camphor in, also Chloroform
no increase in solvent power noticed
I have Corked the tube & hand it away
& put fresh paper in the bottle
I took some crystals & mixed them
with paper & put in a test tube to
melt the Chloral by heat, it
appeared to 1/2 semi dissolve the paper
put chloroform in this didn't help
it - Corked & set away = put some
paper in tube with Crystals Chloral
& Bisulphide Carbon, have set it away

Electromotograph Experiments for last 5 days.
After trying a great variety of disks of paper upon the Chalk, both hard glazed, bibline, and high lead glaze, we thought of Silk, Cut a washer of very thin Silk. wet it with a solution of Caustic Soda and Ferrocyanide and laid it on the Chalk when the results were splendid and exceeded ~~anything~~ Everything tried (papers & chalky subs) afterwards we tried a number of Silk disks & different Solution but we did not afterwards obtain such good results as with the first disk of Silk which may be attributed to some trifling change in the Conditions, = We notice one Thing about Silk which is different from anything yet tried and that is its beautiful Evenness as seen under the Microscope: and the great pressure you can place upon the EMG lever without abrasing the surface. In fact the point run in a circle on the silk disk for 1/2 an hour ~~+~~ with considerable did not show the circle or an abrasure Even when placed under the Microscope 1 1/4 power and even when it has been used for 2 or 3 hours, a thorough soaking of the disk Caused this circular abrasion or track to disappear, My opinion is that a disk of Silk would last for a week at least, which cannot be said of any other substance Known to me,

Sept 14 1876 W.E.

A strange Curious thing about Silk in the relation is that it only holds the chemical solution on its surface, the solution not penetrating the fibre itself as is the case with the paper, ~~and~~ it holds water only by Capillary attraction in the same manner as a little piece of powdered glass would attract & hold water by Capillary attraction

Sept 14 1876 J.A.Edison

After trying a very great number of experiments we found that the mechanical vibration which we felt had on a metal disk & dry silk became great when moistened and caused the undulation of the signal, We also found that although the Carbonic Soda & Ferrocyanide Solution had great delicacy it could not be substituted to any extent, like acetate of mercury & Carbonate Soda or potash which is attributed solely to the fact that it slips on Oxygen whereas Acetate of Hg & Carbonic Soda or potash increases friction on Oxygen. Then with the Ferrocyanide solution a disk is used with one current lubrication takes place & when the Counter charge of the magnet comes it also lubricates so in this case Compensation by a reversal current does more harm than good in fact prevents the Effect from working while if we use Acetate of Hg & Carbonic K or Na the magnet it with a magnet is shown mainly low in this case the Counter current acts to increase the friction & we thus get double the working difference besides allowing of the use of a Condenser when Cutting out constant Currents, However after finding the important part played in modifying signals and causing erroneous results precisions by the unevenness in friction of Mechanical Substances it occurred that this might be compensated for by securing to a shaft several independant levers provided with platinum points & resting upon the disk of metal. Each lever being held down by a spring and working entirely independant of the other yet all serving to give motion to the lever which closes the circuit. A drawing of the device is shown on page 23, Vol. 5. We had it made and attempt made in a very crude manner and gave great satisfaction. Since the with

the inferior solution we were using though any arrangement yet devised, The theory of using several independant levers to obtain an even friction was this that any bad spot on the disk would entirely destroy a dot or dash if one point were used or one half of the disk might be better than the other half (10) from edge to centre, comparing say 1/2 doz words to some heavy + 1/2 doz light whereas with several levers a bad spot acting on only one lever would be insufficient to give a false signal it being necessary that the bad spot should pass at least under 2 if not 3 levers; and if one half of the disk had more friction than the other the other half will have more hence 2 levers may be on a dirty & 2 on a more frictional surface hence success; but we found that owing probably to the inferior manner in which the levers were made & their looseness upon their fulcrum the run about on the disk, We then changed the style slightly and made a 4 ~~spring~~ pronged spring as shown on page 20, Vol 5. This worked beautifully smooth on dry silk = We had previously been out of Acetate Hg & having need 2 oz we made a Solution with Na + K and unfortunately use it = (10) Na Acetate = found that on wetting this dry silk mechanical vibration came in quite strong = and the prong that the four points did not give enough Compensation which we attribute to the fact that they are all joined together and if one lifts by a piece of Acetate Hg or grit it drags the next neighbor, thus increasing the friction which was not the case with the four levers ~~and~~ another thing

which militates against this form is that the current passes under each point at different rate of speed and a hard spot on the minor spring would not be so effective in neutralizing as in the outer or Helicter Marks faster; & I believe the relay lever style is the best, but the springs should be separate and run independent all the way to the lever and have their pressure put on their ends & at the same time be arranged to run all or nearly so in the same channel & nearly equidistant from the centre.

Sept 14 1876 T A Edison

While experimenting with the form this was considerable modification of signal, with silk band in platinum fingered clock & mounted with thick black Candy, Ac Hg Na Solution and we could obtain on 140 ohm W U relay & 800 ohms & quite reasonably good words at 100 words per minute speed, having tried an experiment previously of allowing a point to run on a silk diaphragm with only one underneath, and noticing the absence of mechanical vibration it occurred that perhaps the silk band on too hard a substance we then put a piece of ordinary chem paper moistened with the Hg solution under the silk so as to allow of a quiz, the result we striking mechanical vibration nearly ceased and with a single spring pressing on silk we could receive nearly at about 100 per minute through 25000, 26 cell Cond rd = shunted with 140 ohm W U Relay only = and with 800 ohm + relay we could receive at 200 words per minute 100' of feet without a battery or Good signal thus giving best results. Even obtained in the Eng 1st Hence if a proper to enforce that silk is the best for

a surface of all substances yet tried
2nd That Acetate Hg + NaO. is the best solution both on account of its delicacy & increase of friction on O. by removing the current
3rd that a quiving substance must be placed under the silk, ~~th~~
4th that several levers or springs all independent of each other with pressure on their ends and each supporting to move the central lever and all arranged so that the axis is as desirable or nearly so from centre of clock —
5 that the point on these levers or springs should be as small as possible and be very smooth,
6th That the relay lever movement is the best
7th That the slower the enquiring runs the less the effect of mechanical vibration,
8 That great care should be taken to eradicate all friction & shake in the mechanical moving parts.
Sept 14 1876
9th to put the solution even on the silk & to use it quite dry =
10 to obtain your normal friction by the use of mechanical & not by excessive pressure

With the spring 4 point silk + paper underneath we started the line with 60 sheet of Cardium at sending end and recorded direct on anti paper at speed that could not receive owing to weakness & failing + which could not be shunted = with Eng. under same conditions we could get at fair at some speed and sometimes 100' of words without a battery shunted with a W U Relay + 600 ohms =

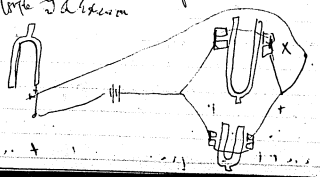
We are now trying a little side experiment placing a cup on disk with a hard rubber centre (page 24 Vol 5) & shaft with disk running in cup in which is a muddy solution of Kaolin & the Reg Solution. This will give a tolerably smooth friction & if there is any working difference it will be OK's I will mention that the disk is of brass whereas it should be platinum to give it a fair trial =

ACOUSTICS

Transfer System Octuplex

Last night got the new set of local forks set up for working 8 messages, the forks especially the high on work beautifully. But the others do not work so even one making an excessive amplitude and sticking the magnet which if it is not allowed to do gives nearly sufficient amplitude (Carefully Examine) but the other one does not give sufficient perfection. Even when sticking the magnet sometimes it has to be set 3/4 inch ahead of the other to balance; there is not so much one that gives great amplitude, but perhaps it is due to the working of the low resonance magnet of the high fork with the higher magnets of the low forks & differences in battery on one fork & the other. The Commutator had to be made an factors on account of the difference in resonance of the two magnets.

Sept 14 1876 T A Edison

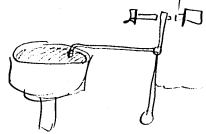


X magnets have together 24 ohms while those on the high forks have only 6 ohms this gives them an undue advantage especially if there is much internal resistance in batteries, if both are in one circuit X works with great power but high fork magnets do not work, we adjust up and found had connections wrong. Changed it = then found that spring connecting wires kept breaking fixed them, then found 38 cells combine at one end would scarcely move the common WU 140 ohm relays increased its effect by shunting relays with 200 ohm thus causing discharge from magnets themselves to bridge over space between waves, still too weak, put on NY battery which was very weak this made it about same, added one this made it stronger got it on one, found bug in harmonic at receiving end fixed, got it on 3 but circuit got it on other wires kept breaking on forks, We are now engaged in obtaining & testing Continuity by a sounder, closing proper points with a metallic wedge,

Sept 14 1876 T A Edison

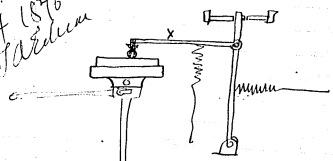
Page 56. Top = We have just finished trying the disk with a muddy (thick) mass like butter) of Kaolin & Reg Na Solution in which the brass disk runs we get a very strong movement of the disk with six cells on short circuit but scarcely any with 150 ohm rheostat = The surface was probably too great besides the surface was brass, to obtain proper friction had to run engine rather fast = Natural working & that is that lever is strong & at a close rather quick but normal

friction Dont "catch" quick enough to draw it away rapidly it being mushy "gives" whereas if it was rapid stiff such as paper it would get its normal friction instantly = it proves one thing and that is that a galvanometer could be made with an immersed disk in a liquid of considerable specific gravity. Afterward we disconnected disk and let wire connecting disk with point lever rest in mushy stuff. The action was much more delicate & rapid & was sufficient to work mechanically with through the 110 ohm relay. Thus



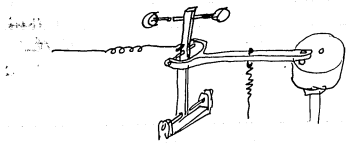
This also proves that you must use small surfaces to concentrate your action on the smallest point that is possible to use. We are now trying what I think is going to be a success. Thus

Sept 14 1876
Edison



on the end of x is a long platina point with a small ball of cotton or other yielding substance covered with silk tightly and wet with the regular solution it resting on a bright

polished platina disk with this giving point and a highly polished disk perfect even friction ought to be obtained with great difference = Edison is now making it = We have just tried it and it works very well. The bag flattens out owing to pressure and this causes after few moments an uneven friction but the first few moments gives absolute even friction. Could this bag be made to stand longer or could be easily changed it would be valuable but Edison has gone back and made the last arrangement which gave such good results thus



This works very nice has some bugs but current wipes them out. A disk of paper moist but rather dry is laid on platina over this is laid the silk tightly drawn the silk is then covered with a thick paste of the Iodide of Hg & NaO, which has just sufficient moisture to connect the paste through the silk with the paper underneath, this paste surface ought to be polished, but after a few moments the point polishes a groove which fit shines all the way round gives even friction, but gives a fine mark if portion is seen to be unpolished still this false jerk is weak & current wipes that

we notice something very prominently with 6 cells. Through 150 ohms shunted with a 12 ohm sounder giving reversals the margin is considerable & when shunt is disconnected and all the current passes through paper the working difference is greatly reduced. Whereas if the reverse current performed no function it should be stronger as it gets a full current. This is what makes the decided advantage of the Wheatstone solution so marked.

Acoustic

Continued from page 57.

We found that the Carbonized Cell was OK but the trouble was all caused by Gilliland giving us a wrong diagram of the connections. We straightened this out and then found the side that was at it was Gotti and we succeeded on short circuit in balancing and sending in opposite directions even when all the other keys beside the mes sending were closed or open. We then tried it on Philadelphia line and it worked about as well. 4 sheets Carbonized. We then closed for the night and Adams then in PM run the loose connections on table nicely, we then started again worked several hours and I then discovered that he had misplaced one of the wires, rendering it impossible to balance one end while the other was OK having got this OK we worked fairly although troubled with want of battery power. I then changed the method of operating the Carbonizing forks & line

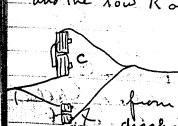
I placed in a local circuit one of the ordinary low forks used one prong to open & close its own circuit, and the other prong with two springs & points one to close the line circuit by high Resistance magnet forks and the other to close a local circuit by the other high resistance magnet forks, after making this Connection found that the other local forks worked even & nicely at both ends which is not the case with the other way the reason of which has already been explained, but caused not get anything through the line at either end = closed = ~~[illegible]~~ This evening started forks with 60 cells Carbon (with battery) each end found current OK but Concentrated Galvanometer will yet cause work on all four without mixing. found that the timing was very much out readjusted Carbonizing forks and got nearly even - current increased in strength and we succeeded for the first time in sending Eight messages on ~~[illegible]~~ one circuit. a feat never before accomplished with morse apparatus 800 ohms was in the line, owing to the fearful storm we are unable get one Philadelphia Loop. I predict that this apparatus will require about 400 cells of battery at each end on a 300 mile circuit. The Quadruplex requires 200, but with this ~~[illegible]~~ battery sometimes may

Sept 17 1896.

may be worked out of the same battery so the excess over that used in the Quad does not amount to much in fact it is economical, besides 8 messages in the product = I also predict that this apparatus will work better & have more Margin than the Quad when it shall be improved as we shall that apparatus. After Running for four hours we put Main battery on and find Circuits ok. put 1600 ohms in artificial line, & with 2300 ohms and as there is 700 in each side Bridge making 3500, and Relay Resistance is 240, this makes bal complete according to resistance, We send on all 8 Keys & all come clear on all 8 Relays = We now shunted line (not to Earth) with 75 sheet Cards takes 48 to balance on artificial, We now put condensers in Centre of Line, 800 ohms Each side & ground other end. and find that we get every thing clear requires no change in resistance but adding 24 sheet Cards at Each end to balance;

Sept 26.

Between Sept 17 and this date we have been trying various Experiments, and find that owing to the Magnet Discharge our plan of overcoming the Excessive resistance of the magnet after the slow fork and the low R of the high fork by connecting thus



is a failure as the discharge from the magnets are unequal that from X being the greatest hence C discharges uselessly the extra current from X passing through it in a contrary

direction while X is prolonged by its own extra current This necessitated a great change in the contacting fork springs as more or less battery on the local forks generated extra current of different strengths, we obviated this by using only one spool on each magnet of C and connected both it and X in the same circuit thus destroying the closed circuit in which the extra current could circulate and do mischief = We also tuned the forks so that they would start of their own accord when the magnets were some distance away. I find that the tension on the contact springs and the portion of time when the fork is touching and not touching is an important factor in keeping all the forks in unison; to obtain a perfect unison the springs should be in contact with the forks all the time, and the tension should be very nearly alike, I also find that tuning forks may be adjusted to any rate by a spring pressing against their end. instead of weighting them, We now have the two contacting forks in the same circuit which ckt is operated (1) opened + closed by a spring & point on a low fork local, and I have the switching fork local points adjusted alike on both forks so they close simultaneously and I find this to be correct and the ckts didnt change last night at all after we made the change of C.T.X. Having got the unison practically and theoretically Correct and reliable, we find can do first class work on Resistance line with 80 cells Called Each end with 2 3 4 5 6 or 8 thousand ohms = But

when we attempted to work the Phila loop 120 miles we found that the slate change invariably changed the current throwing No 1 Mesg on No. 2 Relay & No 2 mesg on No 1 Relay I can only account for this by supposing there is a retardation of one pulsation or the $\frac{1}{120}$th of a second, in the passage of the Current, this would do it. Allowing this, I could get 4 message at either end fair fairly that could balance fine enough to get it clear although you could read it, but taking in consideration that there was very considerable Escape and there was only required 1000 ohms to balance & we having only 80 cells called this was a good showing. We ought to have had 3 times as strong a received Current and as you can balance a strong outgoing Current as finely as a weak one the intrusion would not be so near the strength of the Recd Current. We use back point relays Now and close the Sounder by stopping of the Current We think it works better. Repeating Sounders appear to improve equal but they are hard to Manage;

Electric Sewing Machine

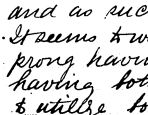
Oct 22nd 1876

Edison's idea that the greatest amount of power can be got out of a magnet by the aid of a tuning fork seems to stand good so far. We applied the principle to the driving of a Wilcox & Gibbs sewing machine and succeeded in stiching through 6 thicknesses of cloth at a speed of 82 stitches per minute with the following device:—

Fig 1

A is a fly wheel on same shaft as 300 tooth ratchet B. This ratchet is driven by 2 pawls D & E working by prongs of 12in fork giving about 60 vib. per minute. This wheel A was connected by belt to sewing machine This device was made from stock in hand and was only a preliminary experiment and as such far exceeded our expectations. It seems to want a much larger fork, each prong having large weights on & each prong having both push & pull pawls on so as to utilize both backwards and forwards movements of prongs. I now altered the ratchet to 30 teeth and put it directly on the sewing machine shaft thus:—

Fig 2



A is ratchet fastened directly on to shaft carrying fly wheel B. This was run in the same manner as Fig 2 only clicks were altered to suit the upright ratchet wheel. This did not work so well it seemed to require more power as ratchet was smaller.

It seems to be necessary to get some motion on wire that will not allow the fork to throw out. Monday Oct 23 3 a.m. 1876 Chas Batchelor.

Discovery

Nov 3rd 1876

I have three bottles containing in a 100cc HO. 1 5 + 20 gramme solution of Tannate of Iron. I find after many weeks that a thick deposit has formed on the side of the bottles facing the light. I do not know how long it took to bring this about, on the 1 gramme solution it is thin & clean on the 5 gramme from some cause (poly bottle been exposed all round) the deposit is all round but on the 20 gramme it is sharp where exposed very thick but not so clean as on the 1 gramme solution = This fact can probably be used in photography and its allies, for printing etc = [illegible] T. A. Edison

Phenomenon - after many weeks there appears a crop of crystals both at the bottom of the bottle & floating on the solution. These crystals are of amber color and apparently square 1/32 sharp edged and are very transparent = I never saw such crystals from crystallizable chemicals = The solution is 1 gramme of Acetate Strychnine in 100cc Rain water.

Phenomenon 14 grammes of Acetate Uranium 100cc HO Crystalizes only on side of bottle exposed to the sun - other side in diffused daylight = these crystals creep up on side bottle & where 1/4 inch from surface of the liquid = Same with 8 gramme 100cc HO proto-acetate Copper - creeps up 1/2 inch deposits large crystals in quantity = Same with Granule Mercury 20 gramme Sol = Same with Acetate Morphia 5 gramme Solution, Cant say how long that takes crystallizing = poly 1 month at least = also formate Copper in 4 10 + 20 gramme also Oxalate ammonia in 20 gramme Sol & Many others = Sulphate Aniline 10 grs in 5 gr. shows greatest. Crystalizes from much of solution in bottom 4 inches above surface of the solution the [illegible] may be due to pouring some of it out [illegible]

Phenomenon = 9 water in bottle ammonia 10 & 20 gramme solutions & another sale which show a fungus growth (re) cotton like stuff that when it settles it settles at the bottom & back further from the sun —

Phenomenon: 5 grams Gum Myrrh in 1 gramme Caustic Potash Sol 100cc a sponge like cloud rises up in the solution in that part of the sol towards the sun = it doesnt adhere to side bottle or apparently touch it - its clear on other side =

Phenomenon - Noticed that certain bottles & Sals gave shades of Colors out of 300 only 5 gave them distinct & these were corrosive solutions, 1 gram Sol Caustic Pot gave it good also Oxalate Pot = Changed bottle & which appeared to diminish it, very poor bottle may be something in it - try change Phenomenon (Oxalate Ammonia 5 grm (Caustic Baryta 1 gramme, Sodium Soda 5 grm) 500 mls gm Caustic Potash = Nov 3rd 1896 T A Edison

Nov 4 1896 T Edison

Stopper washed in 1 gramme Sol Cupric Chloride held over lamp soon blacken & give valuable blue light plays around paper very pretty =

Discovery

On about half of the bottles containing the 1 5 10 & 20 gramme solution of the sub-salts in 100cc Rain water I notice on the side of the bottle towards the wall & the least exposed to the light ~~that~~ and running from the surface of the liquid nearly to the cork a bow, like a rainbow running up from one point on the horizon to another point but it consists of drops of water (no color) this, all shew the bow -

Nov 6 1896
T A Edison

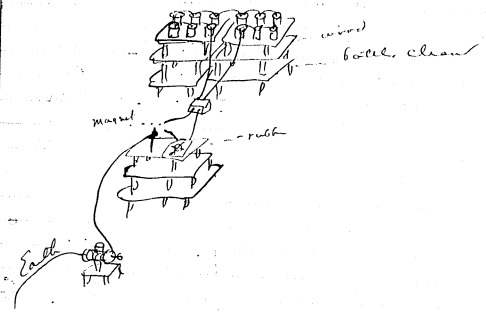
Phenomenon =
Certain kinds of tissue paper if placed on the palm of certain persons hands curl up and thick or brat (re) curl up then uncurl slightly then curl up again & keep doing this at apparently regular intervals for any length of time = on the palm of some persons it cannot be made to curl or move.

Nov 6 1896
T A Edison

Nov 5 1876

Etheric Experiment.

12 Cells Carbon Battery, connected in Series



with 6 ohm magnet zinc cylinder on magnet head brilliant as usual = ~~put zinc cylinder 6 inch away~~. Took 5 pound bundle no 16 branded office wire. Coil 10 inch diameter 4 inch hole 3 inch high. put cylinder of Copper in centre, brilliant spark. put zinc cylinder 6 inches distant from Coil & Copper, still plain, Wrapped this Cylinder with but 1 turn of office wire around it touching ~~separated~~ = no spark then after 1 minute trial =

5 Below Zero - Dec 10 1876. E-1647

No fire in Laboratory fearful Cold great wind Storm nearly blown windows down had brought down 20 poles (Telegraph) Record of phenomenon of freezing of 6 different Chemical Solutions.

100 Milligrams Citric Acid in 100 cc H2O. Frozen Solid in 4 oz bottle transparent Cracked beautifully in Centre there is a Egg shaped piece which looks like Cotton. The surface towards Cork is very uneven Such as place transmed in other 24 hours

1 gram Camphoric Acid - 100 cc H2O = raised in place on top 1/2 inch = Gradually expanded bottle broke =

1 Gramme + 400 MG. Cyanide Silver + 100 cc H2O. Above frozen by 3 o'clock spread out from Centre in Curves 1/2 bending upwards + 1/2 downwards.

500 mg. Hydrate Strychnine same.

Chloride Zinc 1 gramme 100 cc same on end of photo tube in glass tube =

1 gramme Sulphate Soda ~~Supersaturated burst bottle~~

20 grammes pyro pulline 10 cc = Beautiful Brown Sublimation of crystals inside of bottle

E-1894

From (cyanide) compounds of potassium looks deep yellow.

1 gramme gum Guaiacum has fuzzy looking stringed egg in centre bottle with numerous streaks running from it

20 grms Nitrate (lead) throws up a bubble ½ inch high in centre on surface of solution

Picrotoxin 500 MG = White opaque column in centre & clear ~~at~~ otherwise looks as if ice had thrown the picrotoxin with great force = thus appears to illustrate that phenomenon strongly.

Iodine 1 gram in H2O 1 cc shows fuzzy column in centre coloured but liquid around it is clear = thus is like picrotoxin

Dimethyl Chloride Camphor (Iodine dissolved bottle sold off the small crystals)

June 6th 1897

Arsenite of Soda Strong solution on time shows Mica like crystals which on concentrated sol lay flat in stella and are perhaps ½ to inch diameter just like thinnest mica sheets by tipping bottle they may be seen = they coated the surface of the outside of the bottle of gave out prismatic colors mostly ~~violet~~ light green in weaker solutions Crystals smaller if they are crystals

The Corks of the bottles containing Iodide of Iron in solution become in some time dark soft and smell like Iodine. by squeezing them they are shown to be full of liquid which colors the skin yellow & is undoubtedly Iodine. This phenomenon is very striking both a 1 5 to 10 gramme sol in 100 cc colors cork = very dark - June 6 1897 : 1 gm sol Iodine in 100 cc colors corks same way not so deep though = smell same - 2 gr. Iodine 3 mo shows no color on cork

A 1 gramme in 100 cc Creosote disintegrates the cork the bottom is colored brown & all the small holes are smoothed. A small strength of Creosote

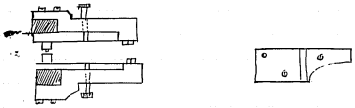
June 6 1897.

20 grammes sol Dextrin in 100 cc H2O. smells after 4 mos very ~~roll~~ like Cider (new)

Ter-Chloride Antimony completely disintegrates the cork so it became hard brittle, & is pulverized in the hand to a dark brown powder (dry) -

Crystals of Prolosulphate of Iron turn white in that part of the bottle which receives the greatest amount of light =

New receiver for Telephone July 8. 1878



Armature must be as long as the diameter of the spool

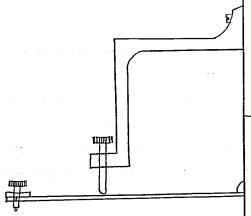
Copied from page 1. E.D.R. Record

notary stamp attached Oct 8. 1878

Wm. Carman

Electro motograph receiver for Telephone

June 19. 1878



Copied from page 2. this Telephone receiver Oct 8. 1878

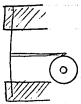
W Carman

Elec. Mg Exh for a New Receiver Sept 17. 1878

Caustic Strontia
2 Hyposulphite Ammonia
0 Nitrate Lime
1 Bisulphide Carbon
T Castor Oil
Sulphate Soda
Chloral Hydrated
4 Cust Ammonia
Nitrate Strontia
x Starch
x Oil Mustard
Neat's Foot
Ether
0 Nitrate Lime

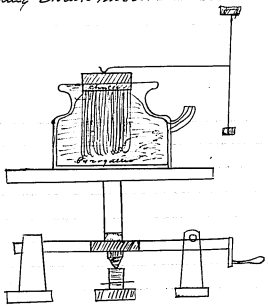
Copied from page 2. New Rec record Oct 1. 1881
W Cumm

New Receiver Sept 16. 1878



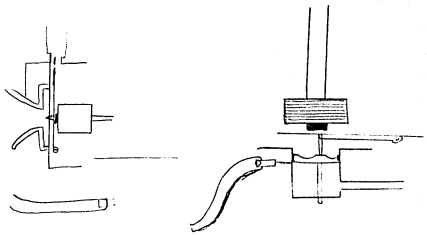
finely powered chalk
" " " mixed with turpentine
" " " Lamp Black
" " " Black Lead

Sulphate of B
Olive Oil & Pyrogalic
Nitrate Uranium - dissolve in Glycer Olive Oil mustard
Magnesia " " " "
Chalk and Pyr good - a wick made which attracts the Pyr up to chalk by capillary attraction. consequently keeping chalk moist



Copied from page 4. New receiver record Oct 8. 1881
W Cumm

New Receiver June



Copied from page 5. Her receiver re-arrangement Oct 1.11
W Carman

Telephone Receiver Sept 23. 1878

Chloride Calcium N 4 wont melt
Carbonate Potass " " "
Cinnabar saturated with a Solution of Caustic Soda Pyro. Glycerine and acetate Mercury — Good
Chalk and Caustic Soda. Good at first but does
Salt Petre and acetate mercury. Irregular Keeps dry
Chalk saturated with Solution of Caustic Soda pyro-Glycerine and acetate mercury Good after standing - very good and come even and good after running off
Caustic Soda — fused — N.G. —
Sulphate Soda and salt Petre - very bad - N.G

Copied from page 6. The Rec record Oct 8 1878
W Carman

Telephone Receiver Sept 23. 1878

Cork saturated with ammonia - N.G
Cork saturated with ~~f~~ Caustic Soda, Glycerine acetate Mercury
Pyrogallic acid. N. G

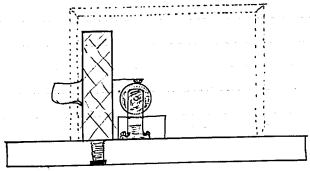
Telephone Receiver Sept 24. 1878

Chlorate Potash wont fuse	
Bromide Pattassium	N G. wont fuse
Sulphate Magnesia	N G. wont fuse
Ferro. cyan Potash	N G " "
Sulphate Soda	to deliquesant
Chloride Lime	N G. wont fuse

Sulphate Baryta powered and mixed with a Solution of acetate Mercury. pyro. Glycerine and Caustic Soda: works very Good but is rather to soft

Copied from page 7. Her Rec Records
Oct 8. 1878. W Carman

Sinking the Receiver Sept 26. 1878



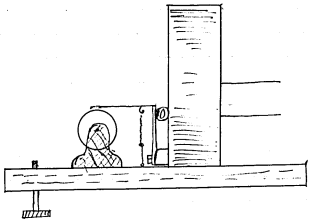
copied from page 8 the Rec Records Oct 8. 1878
W. Carman

Emy Recd Receiver Sept 17. 1878

Acetate Mercury & Cano Potash
Acetate Mercury
- Cianatic Potash
- Iodide Potash Iodide Soda
Nitrate Uranium
Oxalate Cerium on H. Tin - Fine. low heat
- Cupric Chloride
Lactate Zinc Silver - H-
+ Sanitaline
- Acetate Manganese
Cobalt
- Nitrate Magnesia
- Iodide Cadmium - Nic and Zinc
+ Santilene Copper
- Formate Soda — lead
Pyrogalic Acid
+ Liconice
- Carbonate Ammonia
Cianatic Soda - plor
- Tartaric Acid
x Bisulphide Carbon
x Turpentine
- Glacial Acetic Acid
Acetate Nickel
Molybdic acid Lead

Copied from page 7. New Receiver Record
Oct 8. 1878 Wm Carman

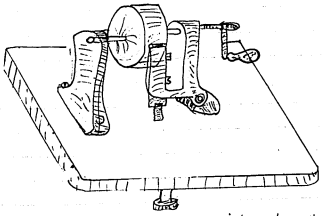
Speaking Telephone Receiver Oct 3. 1878



Copied from page 10. Rec Rec Records Oct 5. 1878
M Carman

Recd Receiver Oct 8. 1878

attachment for burning discs



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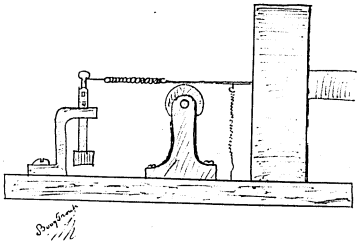
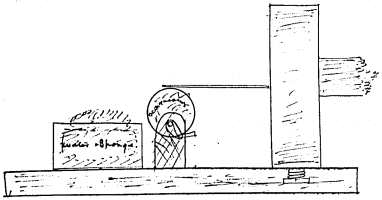
Speaking Telephone Receiver Oct 8. 1878



Copied from page 17. new Rec. Rec Oct 7 78
Wm Carman

Speaking Telephone Receiver Oct 3. 1878

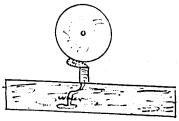


The above enclosed in a case to prevent exposition

delignement

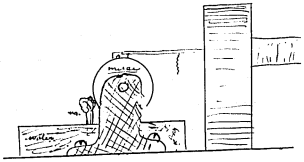
Copied from page 16. New Receiver
Record Oct 5. 1878

Speaking Telephone Receiver Oct 4. 1878



Copied from page 18. New Receiver Oct 8. 1878
Wm Carman

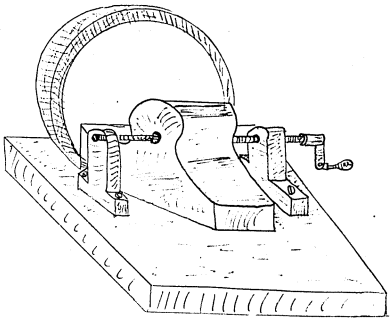
Speaking Telephone Receiver Oct 4. 1878



A Point mounted of some metal and should or rise, and attached

Copied from page 15. New Receiver Oct 5. 1878
Wm Carman

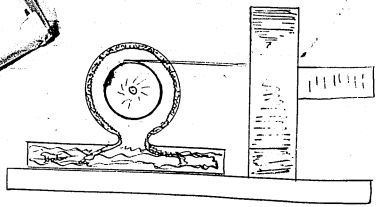
Speaking Telephone Receiver Oct 11 1878



Copied from page 16 new receiver Oct 8. 1878

W Cornman

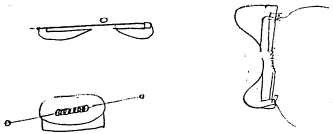
Speaking Telephone Receiver Oct 11. 1878



Copied from page 17. New Rec Rec Oct 8. 1878

W Cornman

New Receiver Oct 2. 1878



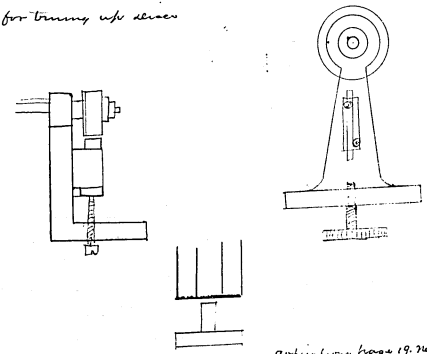
air draft covers platina and allows the resistance.

Copied from page 18. New Rec records Oct 8. 78

W. Cornman

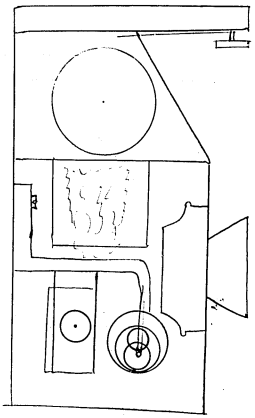
Speaking Telephone receiver Oct 2. 1878

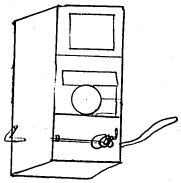
for turning up screw



Copied from page 19. New receiver Oct 8. 1878. W Cornman

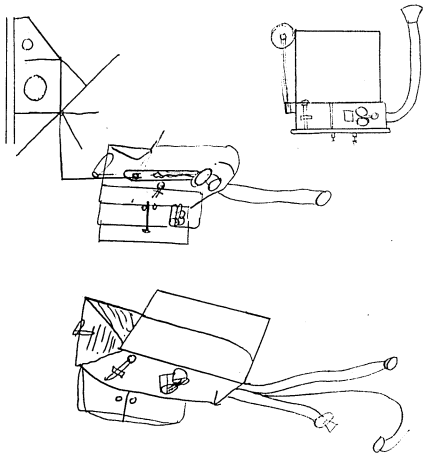
New Receiver Oct 7. 1878





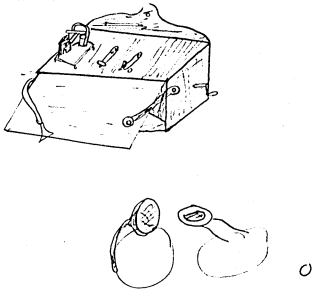
Copied from page 20 new receiver Oct 8. 1878
D Farmer

Experiment on New Receiver Oct 7. 1878



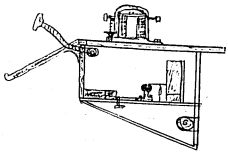
Copied from page [illegible] New Receiver Oct 8. 1878. [illegible]

New Receiver Oct 7. 1878



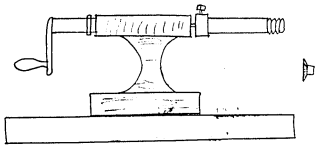
Copied from page 22 new Receiver records Oct 8. 1878
Wm Carman

New Reciever Oct 7. 1878



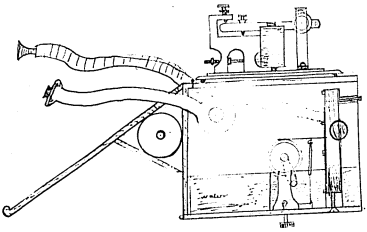
Copied from page 23. New receiver Record Oct 8. 1878
Wm Carman

Speaking Telephone Receiver Sept 19. 1878



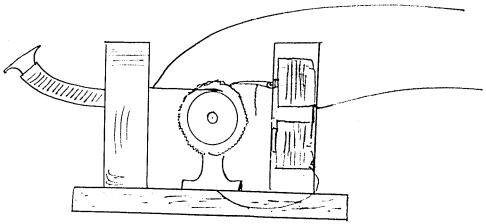
Copied from page 24. New Receiver Record
Oct 9. 1878. Wm Carman

Speaking Telephone Receiver Oct 7. 1878



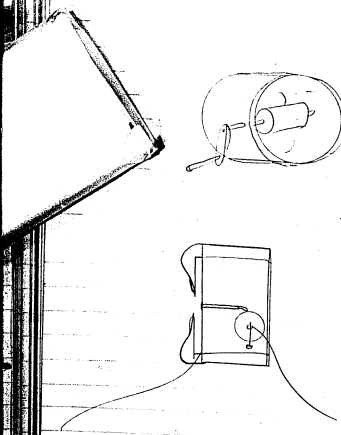
Copied from page 25. new Receiver record
Oct 9. 1878 Wm Carman

Phonomotor - Motographs Tel Receiver
Oct 9. 1878



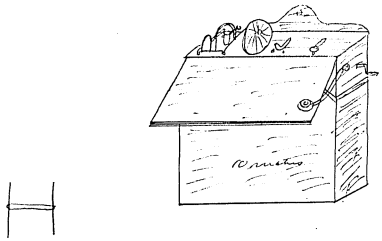
Copied from page 26 new receiver record Oct 9. 1878
M Cunnan

New Receiver Oct 9. 1878



Copied from p. 27. New Receiver Record
Oct 9. 1878 M Cunnan

New Receiver Oct 10. 1878



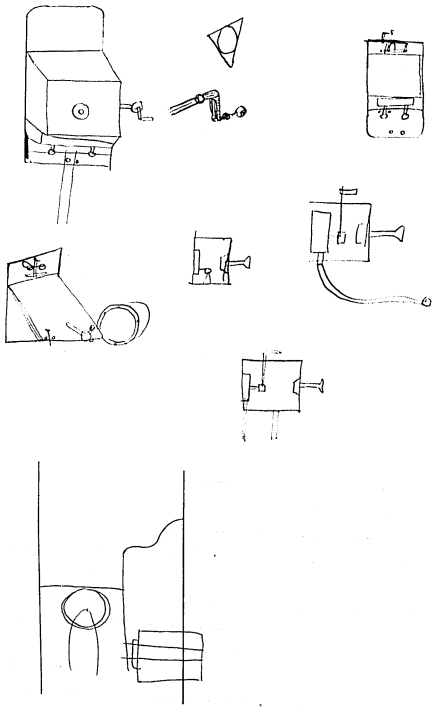
Copied from page 28 N. R. Record Oct 14. 1878
M Cunnan

New Receiver Oct 11. 1878

Receipt for making Buttons for new Receiver
10 - pennyweight chalk -
1000 Grains - Acetate mercury -
20 - minimum - Caustic Soda & saturated Solution

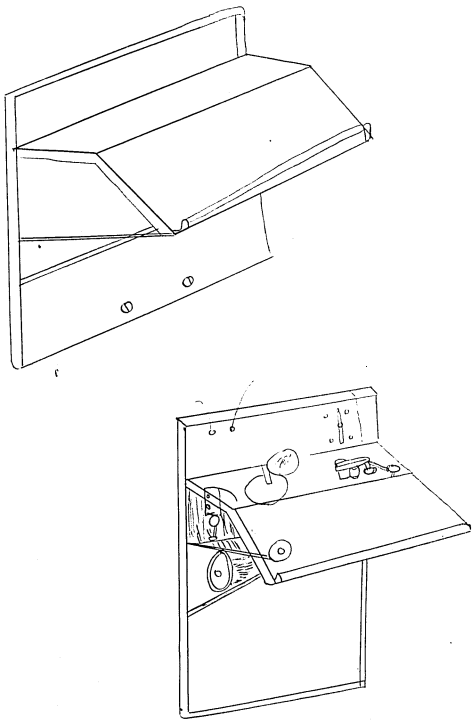
Copied from page 29 New Receiver Record
Oct 14 1878
M Cunnan

New Receiver Oct 12. 1878



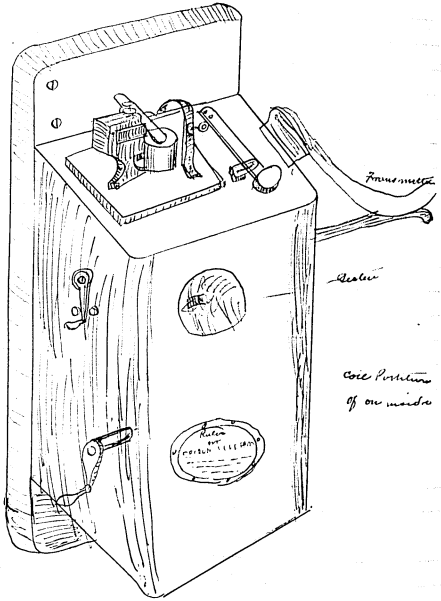
Copied from page 30 New Rec records Oct 14. 1878
W Bowman

New Receiver Oct 13. 1878



Copied from page 31 New Receiver Oct 14. 1878
W Bowman

New Telephone Receiver Oct 13.1898



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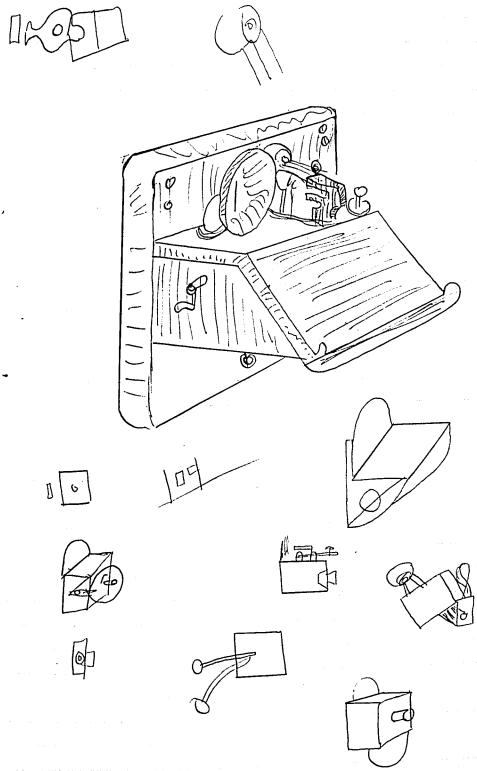
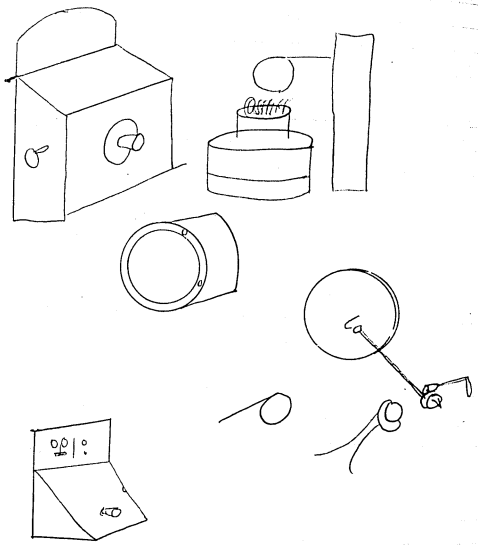
New Receiver Oct 13.1898



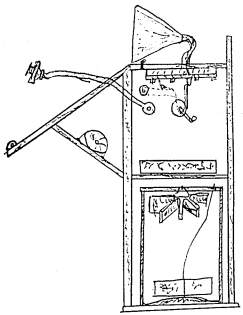
Copied from Page 33. New Rec. received Oct 14. 1898
W Cannon

New Receiver Oct 13. 1878



Copied from P 34 New Receiver record Oct 15. 1878
W Carman

New Receiver Oct 15. 1878



Copied from Page 35 New Rec records Oct 15. 1878
W Carman

L. W. Serrell March 5. 79

A U.S. patent is to be taken out on this for W.U. for which I furnish you a model. I also furnish you a second model to go with the Canadian patent.

This is the U.S. Specification

The object of this invention is to transmit and reproduce sounds telegraphically at a distance with great power and without loss of volume. The peculiar action upon which this action is based was patented by me. (Original Electro-motograph patent) and numbered an application of this action to telephony was also patented (or applied for) (L.W.S. This is the patent where a band of paper was used). The present application consists more particularly in devices which make the invention perfectly practicable for use in commerce and infinitely more reliable and effective

A is a cylinder of compressed chalk soaked in an electrolytic solution such as a caustic alkali that it may become a conductor of electricity. I will mention that any finely divided non-conducting material or porous body having capillary pores and which has no chemical action upon the absorbed solution may be used. This cylinder is sinned to a shaft B and the whole is rotated by the operator by means of the toothed wheels C & D and shaft and handle E & F worm and pinion may be substituted and

motor power of a clock work or analogous motor to replace the hand of the operator. Resting upon the cylinder A is a flat spring g connected to the diaphragm H this spring is pressed upon the cheek with a pressure of several pounds by means of the wire K + spring h the screw m serving to increase or decrease the amount of pressure. The Line wire X X is connected to the spring g while the earth wire is connected to the shaft on which the cylinder A is secured. If now the cylinder be rotated in the direction shown by the arrow and no current passes the normal friction of the spring g upon the surface of the cylinder A will be very great and the spring will be carried forward in the direction of the rotation of the cylinder this pulling inwardly the diaphragm H. If now a current passes whose direction is such that Hydrogen will be produced upon the surface of the spring g in contact with the chalk the friction will be reduced to an extent proportionate to the strength of the current, hence the diaphragm will regain its natural position and continue there so long as the current passes as the friction between the spring g + A is too small to produce sufficient traction. If now the current ceases the normal friction at once obtains. The traction increases and the diaphragm is instantly pulled outwardly. If now a current in the opposite direction is transmitted the effect is scarcely noticeable as the Evolution of Oxygen upon the surface of the spring g does not except with a few exceptions decrease the friction like Hydrogen but on the contrary generally tends to increase the normal friction hence I allow a constant current to circulate on the line and am thus enabled to utilize the opposite wave by causing them to weaken the constant current which is always in a direction to evolve Hydrogen on the surface of the spring g. for instance if no constant current

was upon the line the only waves in one direction would produce an effect whereas if a constant current is circulating one of the waves is added to that of the current and the other wave neutralizes or nearly neutralizes the constant current hence the tendency of one waves to produce a lessening of friction of say 5 units which added to that produced by the constant current say 5 together give 10 units. If now an opposite current is sent it neutralizes the constant current and we have the normal friction of the cylinder, whereas if no constant current was used one current would lessen the friction by 5 units + the opposite current would perform no work.

n is a receptacle containing water; resting in the water is a roller R composed of any flexible absorbant substance such as sponge or felt. A lever to which the roller is attached by which the roller may be brought in contact with the cylinder A extends through the box to the outside. The object of this device is to supply the cylinder with water lost by evaporation and make it a conductor to the electric current.

In practice when all the apparatus is enclosed in a cast iron case the loss by evaporation is very small and if the roller be held against the cylinder and if the cylinder be rotated three or four times the chalk will take up sufficient moisture so that it will perform its functions for a week or more without again wetting it.

The connections are as follows:
T. is the regular Carbon telephone transmitter placed in a local circuit with an induction coil Ic with local battery. If the position of the switch lever is on the button n then the current proceeds from the local battery X X via wire 1 thence through the primary coil thence via wire 2 to 3 thence to the switch lever thence via wire 4 through the Carbon transmitter thence by wire 5 to the post 6 thence to the battery. The sonorous waves of the voice are translated into electric waves of a position & regular character in the secondary coil of the induction Ir in the well known manner.
The connections of the main line are as follows. The line from the distant station enters at the post 8 thence via wire 9 to the bell thence via wire 10 to the key lever thence via wire 6 to the point p of the switch thence via wire 7 to the spring 9 of the receiver, thence through the moist chalk to wire 8 to and through the secondary coil thence via wire 3 to the switch lever which it will be remembered is in n thence via wire 4 through the transmitter to wire 5 thence to post 6 and thence via wire 12 to the post c which is connected to the earth.
I will mention that either of the posts 8 - c may be connected to the ground a line. It will be noticed that the main line passes through the transmitter which is connected to the local battery hence a portion of the current leaks into the main line and it is this portion which thus leaks into the line that serves as a constant current for short lines but if the line be too long or current so weakened as to be insufficient to produce a lessening of friction between the spring 9 and the chalk hence I insert one or

more cells in the main line. While the switch is in this position (ie) the lever in contact with n transmitting & receiving can go on simultaneously by turning the switch lever to the point p the telephonic apparatus is disconnected and the call bell apparatus becomes operative, the line enters at the post 8 passes through the bell via wire 9 thence via 10 to key thence via 6 to p thence via lever to wire 3 thence via 2 through the primary coil and via 1 to local battery through that to post 6 thence via 12 to post c to earth; by depressing the key the circuit is opened & closed & the two local batteries, one at each end, of the line, become operative to ring the bell.
I will mention that the two receivers herein described and the two transmitters may all be connected in one line and operated without the aid of induction coils but the results are not equal to that from the use of the coils, also that the Receivers will act as transmitters by reason of the fact that when the spring 9 & chalk are at rest the resistance of the whole is generally about 2500 ohms and this resistance is reduced instantaneously to 2 or 300 ohms by the slightest movement of either the chalk or the spring hence the movement of the diaphragm II by the voice produces the same result or nearly so as the Carbon transmitter. If advantage is to be taken of this fact the surface of the spring 9 should be reduced to increase the effect and an induction coil having a primary coil of high resistance used in connection with the apparatus although it is not absolutely necessary as the direct results are nearly as good. In preparing the chalk I prefer to use a salt of mercury mixed with caustic soda, the action takes place no matter what the proportions.

The mercury salt I prefer to use is the acetate of mercury.

I will mention that the moisture of the chalk may be regulated automatically by taking advantage of the fact that the normal friction of the chalk increases as it becomes dryer. A spring resting on the chalk is connected to the wetting roller & has such a pressure and counteracting spring that when the chalk has its proper moisture the friction during rotation is insufficient to produce sufficient traction to lift the roller but when it becomes dryer the traction becomes sufficient to lift the wetting roller & it supplies moisture until the traction is reduced below a certain point and it falls —

I claim the method herein described of producing motion at a distance and reproducing sound waves.

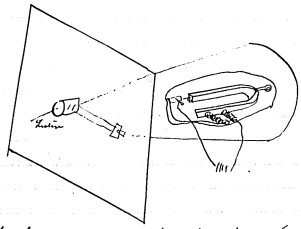
2d The use of a cylinder, disc or its equivalent composed of an inert porous substance moistened with an electrolytic solution with an electrode connected to a diaphragm plate or other body capable of rendering the motions produced by electrolysis audible.

3d — In combination with such cylinder disc or equivalent in a closed receptacle of a moistening roller or equivalent & supply of water substantially as set forth.

(and any other claims that may strike you as patentable)

Voltameter June 21. 1878

narrow aperature leading from a continuous source of sound and expansion of rubber closes aperture to greater and lesser extent

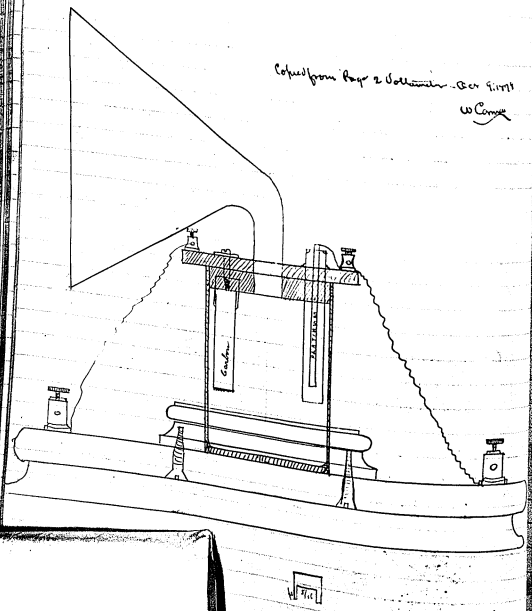


The slot may be the same as a spectroscope and may be opened and closed by a magnet galvanometer needle etc or by a strip resonating motion from a diaphragm having a tone mouth piece =

Copied from page Voc Records Oct 9. 1878

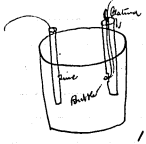
W Pierson

Sonorous Voltameter Aug 27. 1878



Copied from Page 2 Voltameter Oct 9. 1878
W Conner

Voltameter Sonorous
Aug 27, 1878



with measurement made as on attach.

1 drop released in 10 seconds

3 Cells Carbon 1/2 on

"	12
"	12
"	13
"	14
"	14 1/2
"	16 1/2
"	14 1/2
"	14 1/2
"	14 1/2
"	14 1/2
"	13 1/2
"	13
"	13
"	12 1/2
"	12 1/2
"	14 1/2
"	14 1/2

18.0
6.0
12.0 ÷ 13
12
60
60
0

Mean 13 1/2

After this we put in current 100 ohms
1 drop in 12 1/2 seconds
Now 80 ohms in current
1 drop in 13 seconds
" " 16 "

16
13
3.0
1/2

Copied from page 2 Voltameter Records Oct 9. 1878
Wm Conner

Voltameter (Continued) Aug 29. 1898

With 100 ohms in circuit

1 drop in 16 seconds.

1 " " 16½

1 " " 17½

1 " " 16½

1 " " 15½

1 " " 16

1 " " 16¾

7) 115 ½
16.5

97
86½
11

With 200 ohms

1 drop in 20 seconds

1 " " 20¾ "

1 " " 19¾ "

1 " " 19¾ "

1 " " 20 "

With 400 ohms in

1 drop in 27 seconds

1 " " 26½

With 600 ohms in

1 drop in 34 seconds

1 " " 34

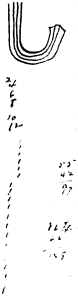
1 " " 34½

With 1200 ohms in

1 drop in 54¾ "

1 " " 53½

4) 109¾
54



Copied from page 4 Voltameter Record Oct 9. 1898

W Carman

Voltameter Continued

With 2400

1 drop in —— 86½ seconds

1 " " —— 87 "

With 4800 ohms in

1 drop in 189 seconds

With 9600 ohms in

one drops in 254½ seconds

1 " " 245 "

1 " " 257 "

168
39
207
35
242
60) 254½
242½

16 : 20
16.5 : 20 : 34½
20
16) 16.5 (1
16

200 : 400
34 : 54 : 86½
34
20
54
40
14
3) 42 (14
3
12
12
42
42

one drops mean 13½
16 ohms 17½
30 ohms (mean) 14½
100 " (mean) 16½
200 " (mean) 20
400 " " 26½
600 " " 34
1200 " " 54
2400 " 86½
4800 " 189

Copied from page 5 Voltameter record Oct 9. 1898

W Carman

Voltameter

with 600 ohms in

1 drop in 30 sec
1 " 31 "
1 " 32 "
1 " 33 1/3 "
1 " 33 1/2 "
1 " 34 "
1 " 33 1/2 " alarles to worn

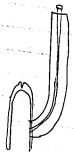
Put in one carbon cell and 600 ohms
1 drop in 165 seconds
nearly four times as long as with 3 cells
probably due to polarization & bubbles (investigate)
1 drop in 164 1/2 seconds
Put in one leclanché cell on 600 ohms
1 drop in 12 minutes 7 1/2 seconds

to see might

Copied from page 6 Voltameter record Oct 1 1878
W Carman

Edisons Voltameter Aug 31. 1878

This is the Boss way for the gas to come from the electrode



as the pressure was always very more chamber — B

Copied from page 7 Voltameter record Oct 1 78
W Carman

Bubble Voltameter Sept 13. 1878

Time 3 cells Leclanché about current 1

H O A H P

6 1/4
6 1/2
6 1/2
6
6 1/4
6 1/2
6 3/4
6 1/2
6 1/2
6 1/2
7
7 1/2
6
6
6
5 1/2
5
5
5
5 - 1/2

some bubbles commence to rise between large bubbles hence the variation
Closed pores of the plate up to prevent the above

Copied from page 8 Volt record
Oct 9. 1878 W Carman

Voltameter Continued Sept 13. 1878

5 3/4	5 3/4
5	6
5	5 3/4
5	5 3/4
5	5 3/4
5 3/4	5 1/2
5 3/4	5 3/4
5 3/4	5 3/4
5 3/4	5 3/4
5 3/4	5 3/4
5 3/4	5 3/4
5 3/4	5 1/2
5 3/4	5 3/4
5 3/4	5 3/4
5 3/4	5 3/4
5	5 3/4
5	5 3/4
5 3/4	5 3/4
5 3/4	5 3/4
5 3/4	5 3/4
5 3/4	5 3/4
5 3/4	5 3/4

6 Extra bubble between this and last

7 " " " "

5 3/4
5 3/4
5 3/4
5 3/4

Copied from page 9 Voltameter Record Oct 9. 1878

W. Burman

Bubble Voltameter continued Sept 13. 1878

5 3/4 seconds	
5 3/4	
5 3/4	
5 3/4	
5 3/4	
5 3/4	
6	5 3/4
6	5 3/4
6	5 3/4
6 3/4	5 3/4
6 3/4	5 3/4
6 1/2	5 3/4
6 3/4	5 3/4
6 3/4	5 3/4
7	observe from bubbles again
7 3/4	Closed up the plate Cette
7 1/2	5 3/4
5 3/4	5 3/4
5 1/2	5 3/4
5 1/2	6
5 1/2	6 3/4
5 3/4	6 1/2
5 1/2	6 1/2
5 1/2	6 1/2
5 1/2	6 3/4
5 1/2	6 3/4
	6 3/4

Recover

Copied from page 10 Volt Record Oct 9. 78

W. Burman

6¾		4¾	5¼
6¾		5	5¼
6¾	Observe smaller bubbles	5	5¼
6¾	coming from hole in paper	5	5¼
6¾		5	5¼
6¾		5	5¼
6¾		5	5¼
6¾		5	5¼
6¾		5	5¼
6¾		5	5¼
6¾		5	5¼
6¾		5	5¼
6¾		5	5¼
4¾		5	5¼
4¾		5	5¼
4¾	make hole in paper smaller	5	5¼
4¾	smaller bubbles also	6	5¼
4¾		5	5¼
4¾		5	5¼
4¾		5	5¼
4¾		5	5¼
		5¼	5¼
		5¼	5¼

Copied from page 11 Voltameter Record
Oct 9 1878 Cr Carman

Bubble Voltameter Sept 13 - 1878

4¼	4½			
4¼	4¾			
4¼	5			
4¼	4¾			
4¼	4¾	Perform front smaller		
4¼	4¼	look in 4th		
4¼				
4¼	Now put on Gold Plates with 3 Pin holes in the bottom			
4½	Rate Bubbles			
4½	3	3	3	
4¼	3	3	3	
4¼	3	3	3	
4¼	3	3		
4¼	3	3		
4¼	3	3	12¼	13
4¼	3	3	12	13
4¼	3	3	12¼	13
4¼	3	3	12¾	13
4¼	3	3	13	13
4¼	3	3	13	13
4½	3	3	13	12¾
4½	3	3	13	11¾
4½	3	3	12½	12¾
4¼	3	3	12¾	13
4¼	3	3		13
4¼				13
4¼				12¾
4¼				
4¼				
4¼				
4¼				
4¼				
4¼				
4¼				
4¼				

Copied from page 12 Voltameter
Record Oct 9 1878 Cr Carman

Bubble Voltameter Sept 13. 1878

Test Electro motive Force

3 cells Ballard Small size 100. ohms Constant

See over Average 18 seconds

3 cells carbon		100 ohms Constant
3 3/4		
3 3/4	4 3/4	4 3/4
3 3/4	4 3/4	4 3/4
3 3/4	4 3/4	5
3 3/4	4 3/4	5
4	5 1/2	5
4	5 1/2	5 1/2
4	5	5
4	5	
4	5 1/2	
4 1/4	5	
4 1/4	4 3/4	
4 3/4	4 3/4	
4 3/4	4 3/4	
4 3/4	4 3/4	
4 3/4	4 3/4	

Copied from Page 13 Voltameter Record
Oct 4. 1878. W Cunnan

Bubble Voltameter Sept 13. 1878

Tests to obtain Electro motive Force of Batteries

10 Cells Ballard Constant 100 ohms

No Cells	1 Cells	2 Cells	3 Cells	4 Cells	5 Cells	6 Cells	7 Cells	8 Cells	9 Cells	10 Cells
		53	12 1/4	6 1/4	5	4	3 1/4	2 1/4		
		67	13	6	5 3/4	4	3	2 1/2		
		25	13	6	5 1/2	4	3 1/4	2 3/4		
		61	13	6	5 1/2	4	3 1/4	3		
		30	13	6	5	4	3 1/4	3 1/4		
		57	13	6	5	4 1/4	3 1/4	3		
		29	13	6	5	4	3	3		
		55	13	10	5	4	3	3		
		30	13	9 1/2	5 1/2	4	3 1/4	3		
			13	8 1/2	5 3/4	4	3 1/4	3		
			13	9 3/4	5 1/2	4	3 1/4	3		
			13	6 1/2	5 1/2	4	3 1/2	3		
			13	7 1/2	5 1/2	4	3 1/2	3		
				7 1/2	5 1/4	4	3 3/4	3		
				8 1/4	5 1/2	4	3 1/2	3 1/4		
				8 1/4	5 1/2	4	3 1/2	3		
							3 1/2	3		
							3 1/2	3		
							3 1/2			
							3 1/2			
							3 1/2			
							3 1/2			

Average 8

Copied from Page 12 Volt Record Oct 4. 1878
W Cunnan

Bubble Voltameter Sept 13. 1878

Ground wire 100 ohms	Seat of cell	2 cells	3 cells	4 cells	Ballon cells	5 cells	6 cells	Battery 7 cells	8 cells	9 cells	10 cells	Gold Beater skin cells	No holes with cells
	5 4/16	46 1/2	12 1/2	7		5 3/4	4 1/2	3 1/4		2 1/4	2		
		45	12 1/2	7		5 3/4	4 1/2	3 1/4		2 1/4			
		42	12 1/2	7		5 1/2	4 1/2	3 1/4		3 1/4			
		42	12 1/2	7		5	4	3 1/4		3			
		42	12 1/2	7		5 1/2	4 1/2	3 3/4		3 3/4			
		41	12 1/2	7		5 1/2	4	3 3/4		3 1/4			
		40	12 1/2	7		5 3/4	4	3 1/4		3 1/4			
		40	12 1/2	7		5 3/4	4	3 1/4		3			
		40	12 1/2	7		5 3/4	4	3 1/4		3			
		40	12 1/2	7		5 3/4	4	3 1/4		3			
		40	12 1/2	7		5 3/4	4	3 3/4		3			
			12 1/2	7		5 3/4	4	3 1/4		3			
			12 1/2	7		5 3/4	4	3 1/2		3			
			12 1/2	7		5 3/4	4	3 1/2		3			
			12 1/2	7		5 3/4	4	3 1/2		3			
			12 1/2	7		5 3/4	4			3			
			12 1/2	7		5 3/4	4			3			
			12 1/2	7		5 3/4	4			2 1/2			
			12 1/2			5 3/4	4			2 1/2			

Proved here capacity of this Voltameter exceed with 1000 ohms

Copied from page 10 Voltameter Record
Oct 9. 1878 W Carman

Bubble Voltameter Sept 14, 1878

Porous diaphragm

Paper — To soft gas appears to burst at after short use

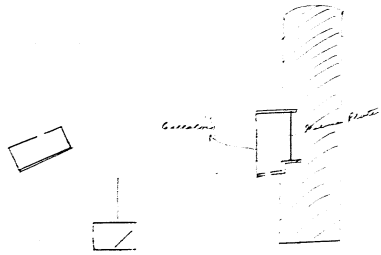
Gold Beaters skin. Better but softens by use and becomes useless

Cork — no better

Stopped up the hole top of the cell and fixed a Collodion face to the cell with hole at top and bottom thus (⊙). This collects the gas in the top of the cell. This also prevents the escape of small bubbles from the face of the Platina Discs after forming as above records more even —

Copied from page 11 Voltameter records
Oct 9. 1878 W Carman

Voltameter Sept 17. 1878



Copied from page 11 Voltameter records
Oct 9. 1878 W Carman

Bubble Voltameter Sept 16. 1878

After Instrument working over night found heavy blackish deposits on the negative Electrode possibly from the carbon used (Solution Hydrochloric used) — —

used fine platina wire in place of the carbon rod — result was the more energy giving off of gas at negative pole. probably this comes from the fact that the wire gives off its oxygen with more regularity than the carbon

Copied from page 18. Volt Record
Oct 9. 1878 Com Cunman

Bubble Voltameter Sept 17. 1878

Constructed a tube Voltameter to make comparative tests with bubble voltameter to ascertain degrees of constancy —

Tube Voltameter

7 Cells =	2' 1½"	2' 1½"	2' 1¼"	2' 1¼"	2' 1"	2' 1"	
3 " =	6' 6½"	6' 7"	6' 7"	6' 7½"	6' 7½"	6' 8"	

Bubble Voltameter

7 Cells =	16"	16"	14½"	14½"	14½"	14½"	14½"	14½"	14½"
8 Cells =	49½	48½	48	46	46	46	46	44½	44½

120 121½ 121½ 121.1 2 32½
4½
5

	Time	233	234	237	238	239	240	233½	236	236	237
Tube	Time	4	4½	4½	4	4½	4½	4	4	4	4½
Carbon	Bubble	5	5	5	5	5	5	5	5	5	5

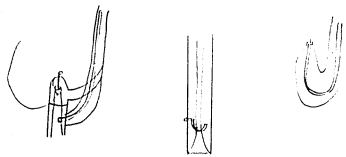
Copied from page 19 Voltameter record Oct 9. 1878
W Cunman

Radiation of Heat

Source of Heat	Degrees Radiation	Liquid in-bounced in Death	Radiation	Per cent retained
Gas Jet	200°	4	55°	
"	200°	9	65°	

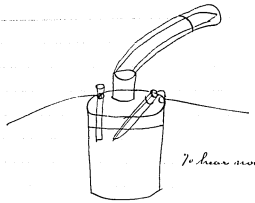
Copied from page 20 Volt record
Oct 9. 1878. W Cunman

Sonorous Voltameter. Sept 27. 1878



Copied from page 21. Voltameter record
Oct 9. 1878 W Cunman

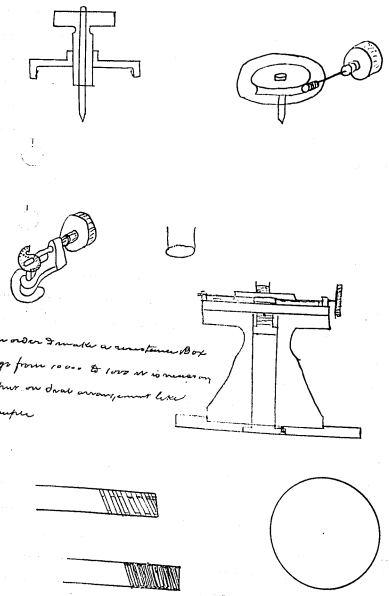
Voltameter Sept 27. 1878



Platinum wires in decomposition cell

Copied from page 22 Voltameter record
Oct 9. 1878 W Cunningham

Carbon Resistance Aug 15. 1878

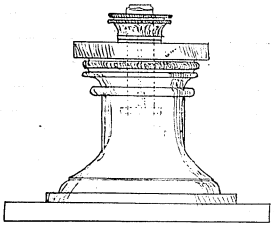


I wonder if would be a resistance Box to go from 1000 to 1000 it is necessary to have an dial arrangement like sample

Copied from Page 1 Carbon Resistance Record Oct 16 1878

M Carman

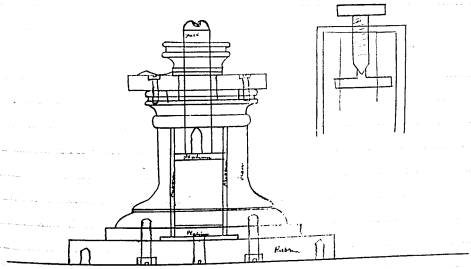
Carbon Rheostat Aug 15. 1878



Copied from page 2. C. Rheostat Oct. 16. 1878

M Carman

Carbon Rheostat Aug 16. 1878

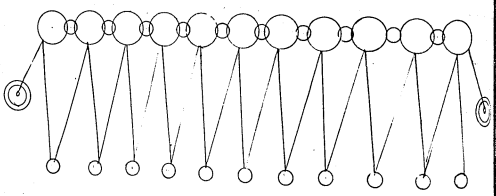


Copied from page 3. C. R. record Oct 16. 78

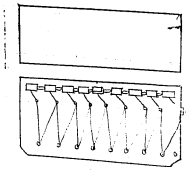
M. Carman

Fractional Rheostat Aug 26. 1878

Shunt for — Functional Balancing mirror & aluminum



20 of these Buttons



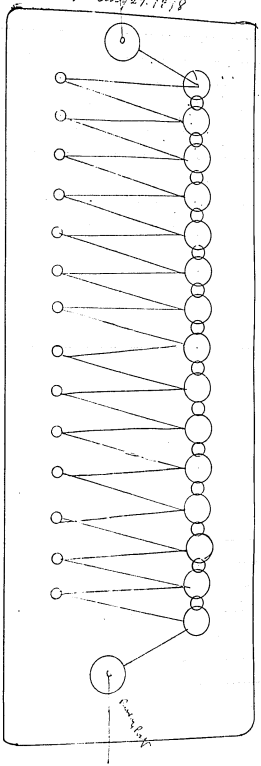
Shunt
Shunt
Shunt

Coiling Battery Button

Battery Button Balancing Shunt

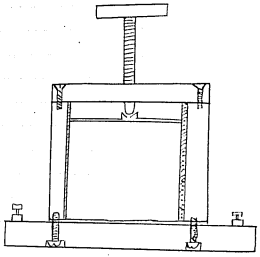
Copied from page 16 Rheostat records Oct 16. 1878
M Farman

Fractional Rheostat Aug 27. 1878



Copied from page 5 Rheostat Records Oct 16. 1878
M Farman

Carbon Rheostat Aug 31. 1878



Copied from Page 6. Rheostat records Oct 16. 78

W. Cannon

Edisons Carbon Resistance Sept 11. 1878

135 Plumbago Lamp test 2 on 3 foot one cell Gallond three cells taken on one ~~cell~~ balanced one on foot

135 discs	deflec 9	1340 ohms		Screw moved down 1/16
135 "	deflec 40	120 "		
1/2 67 discs	deflec 3	3760 ohms		Quad. Carbon Resistor
	deflec 46	60 ohms		
3/4 101 discs	deflect 3	3760 ohms		Copied from page 7
	deflect 42	90 ohms		Carbon Res Rec Sept 11. 1878
1/4 34 discs	deflect 3	3760 ohms		W. Cannon
	deflect 48	30 ohms		
34 discs same with 3 cells		4950 ohms		
		54 ohms		9520
				230

This one cell tests are probably unreliable owing to slight deflection

67 discs	deflection deflection	5400 ohms		
	" 69	67 ohms		120
101 ~~[illegible]~~ "	67	107 ohms	5400 / 4500 / 900	9850
" " "	54	6796 "		5400 / 6706 / 1306

Edisons Carbon Quad Resistance Sept 11. 1878

want to test it with pressure

discs used last night No 3 cells 1 cell Gallond Deflect 1/2 with pressure 34

No 1 make solution that will give 1/2 ohm and try it

water 4 oz		This test
Sectrum 1 oz		2 — 16 —
Plumbago 1/2 oz		

Water 4 oz		
Sectrum 1 1/2 oz		This tests
Plumbago 1/2 oz		1 1/2 — 22

Water 4 oz		This tests	This was rubbed off a little
Sectrum 1 oz 15 dwt		22 —	more than the last
Plumbago 1/2 oz			

Water 4 oz		
~~Sectrum 2 oz~~		This test
Plumbago 1/2 oz		15

Copied from page 8. C Res records Oct 31. 1878

W. Cannon

J. I.

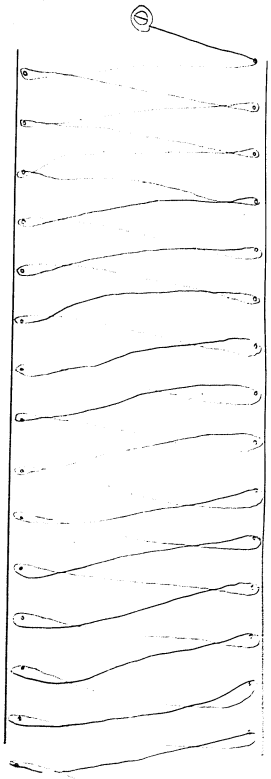
Echinus Cordatus Final Resistance Sep 6. 1878

Old		New			
1 –	23	1	220	80	260
2 –	57	2		1.40	
3 –	33	3		47	
4 –	17	4		326 x	
5 –	17	5	33	206 x	
6 –	24	6			
7 –	54	7			
8 –	58	8			
9 –	24	9			
10 –	28	10			
11 –	18 x	11			
12 –	28	12			
13 –	28	13			
14 –	30	14			
15 –	28	15			
16 –	28	16			
17 –	28	17			
18 –	18	18			
19 –	30	19			
20 –	28	20			
20)	581				
	29 Average alone				

10½ Sol. Number Sept 6. 1876
16

Copied from page 9 G. Rec Records Oct 21. 1878
W Carman

Fractionis Rhenstat Sep 11. 1878



Copied from page 10 Rec Record Oct 21. 1878
W Carman

Carbon Resistance for Quadruplex

3 cells Callaud Battery, Bradley Galvanometer No 1 coil

100 Plumbago discs	2 1/2 inches		
	9	4160	Sometimes 1/4 about
	7 1/2	2160	
75	6	9170	" " 1/3 "
	15	2320	
50	22	1600	1/2 mica tinfoil 5 free up
	48	1150	2 1/2 turns of screw
25	29	1153	
	52	373	3 1/2 turns of screw
75	7 1/2	1730	
	8 1/2	1170	

Turns for 18 hours
Sept 13. 1878
27 — 1640

Copied from Page 11 Resistance Record Oct 21. 1878
W Cunman

Carbon Resistance for Quadruplex Sept 13. 1878

20 Cells Callaud

75 discs of 2 1/2 Plumbago paper cloth made from standard

10 a m Sept 13

75 discs with pressure	75 squares	1440 ohms	
without pressure	62 "	2610 ohms	

tested on 3. Coil

75 discs with pressure	8 3/4	—	1440
	4 3/4		2840

3 Cells Callaud in one coil again

75 discs with pressure	24 1/2		1540
without pressure	11		2870

Take test at 5 hours after 3 P M

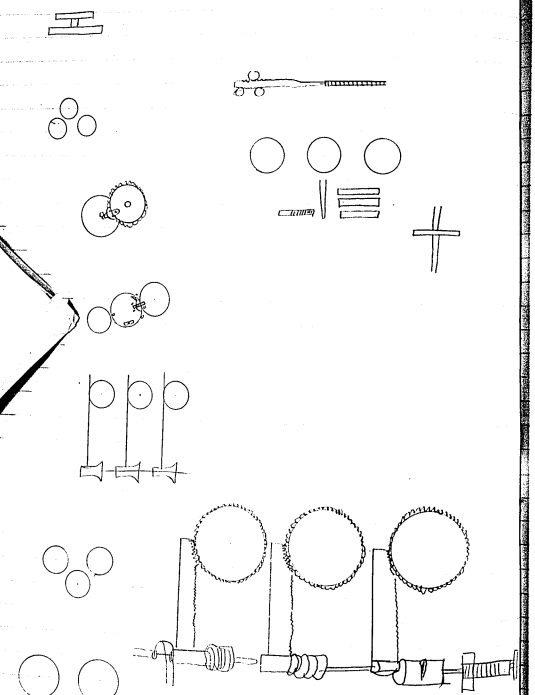
One coil 3 cells Callaud	25	1540 ohms	
	15 1/2	2690	
Cone 20 cells Callaud	73	1440	
	62	2770	
20 cells 3 coil	7	1400	
	5	2670	

3 P M Sept 14
24 hours after

24 1/2	1440
15 1/2	2640
74 1/2	1400
63	2690
9	1400
5	2670

Copied from Page 12 Res. Rec Oct 21. 78
W Cunman

Carlow Rheostat for Quadruplex Sept. 14. 1878

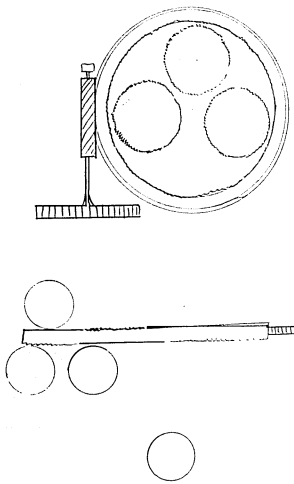


Racks worked by cams so that a set one goes no free distance before another commences and the last one starts back first

Copied from page 13 Resistance Records Oct 24. 1881

Mc Cammon

Carlow Rheostat for Quadruplex Sept. 14. 1878



3 cogs with pressure screws working inside an annular wheel provided with 1/3 cog which takes each wheel by itself and actuates it in same way

Copied from P. 16 Rheostat Records Oct 24. 1881

Mc Cammon

Carbon Resistance per Quadruplex Sept 16. 1878

After taking out the 75 discs and pressing each one amply and then altogether we took this test

		with Pressure		without	
3 Cells Each	1 coil	39 3/4	790	17	2390
30 Cells Each	1 Coil	52 3/4	720 ohm	6 1/4	2390
30 Cells Each	3 Coil	15 1/2	720	5	2390

Sept 18th

100 discs each pressed amply and then together

3 cells each and 1 coil

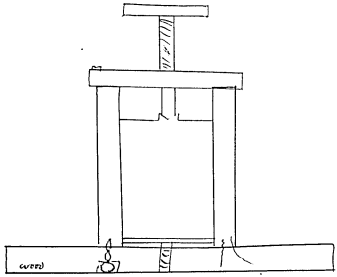
			with Pressures		without pressure	
	Dist Sept 21		35.	523	12.	3.70
20	" " "		35 1/2	523	10 1/2	4070
"	" "	22	75 1/2	770	11 4.	3900
3	" "	23	75 1/2	740	6 0	2.420
"	"		38	760	10 1/2	2490
"	"		14 1/2	764a		
"	"	25	37 1/2	803	10 1/2	1080
"	"	26	37 1/2	803	10 1/2	4080
"	"		39	1105	6.	6630
125 ohm	"		3.	1105	7	6100
		27	3.	1100	11	3720

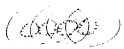
Continued from page 15 Resistance Records

Sept 21. 1878

W. Cameron

Carbon Resistance Sept 21. 1878



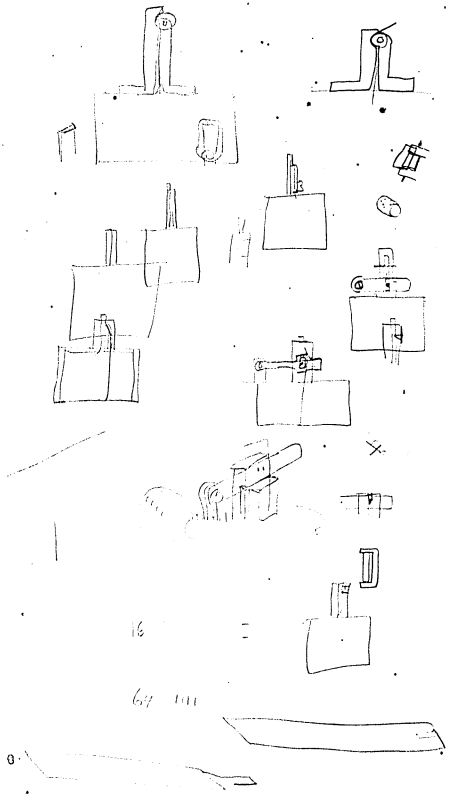


Continued from page 16 Resistance Record

Sept 21. 1878

W. Cameron

E. M. G. Text-

640

Solution.